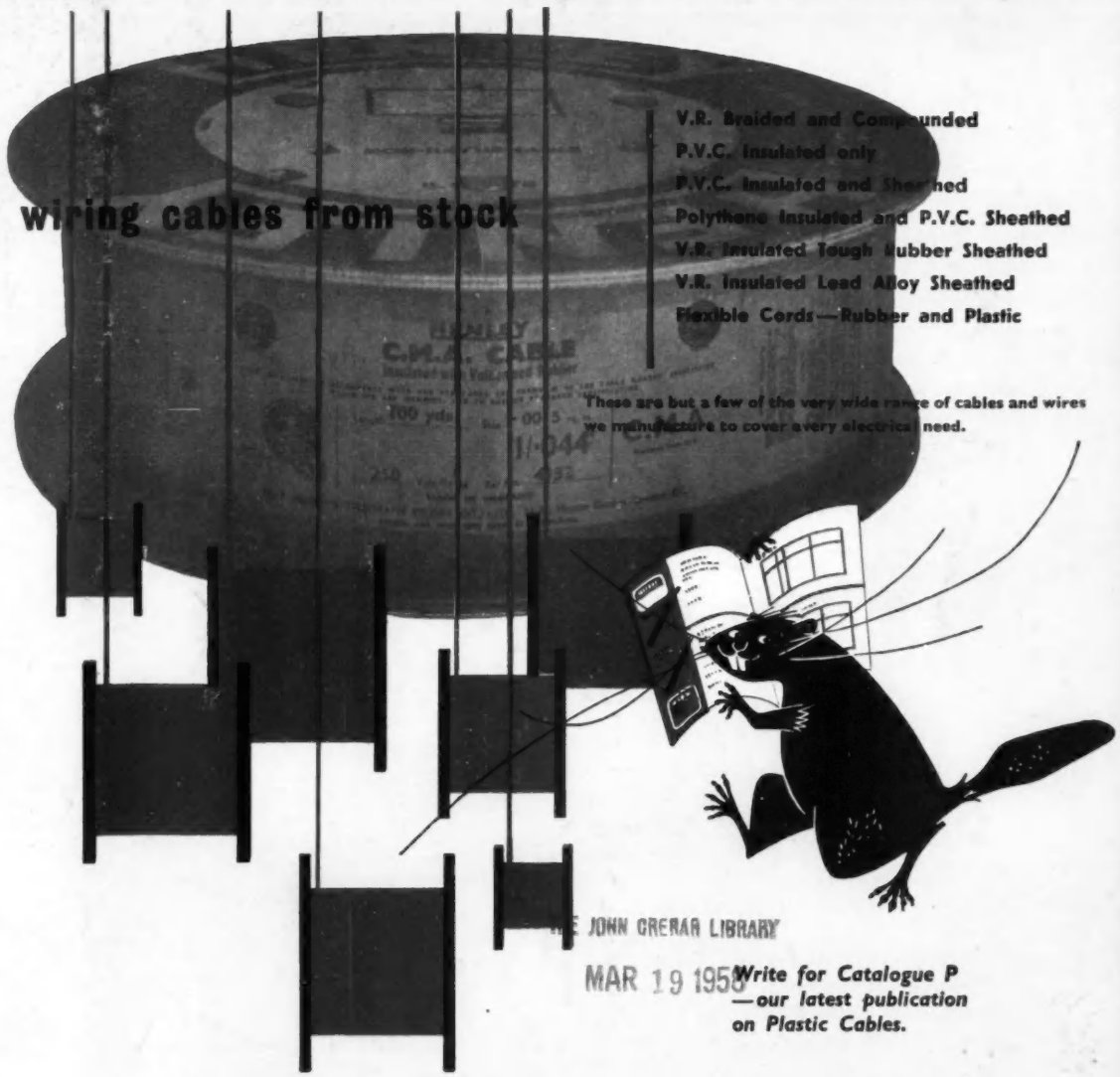
ELECTRICAL REVIEW

621.3

FEBRUARY 1958 PRICE 1s 6d



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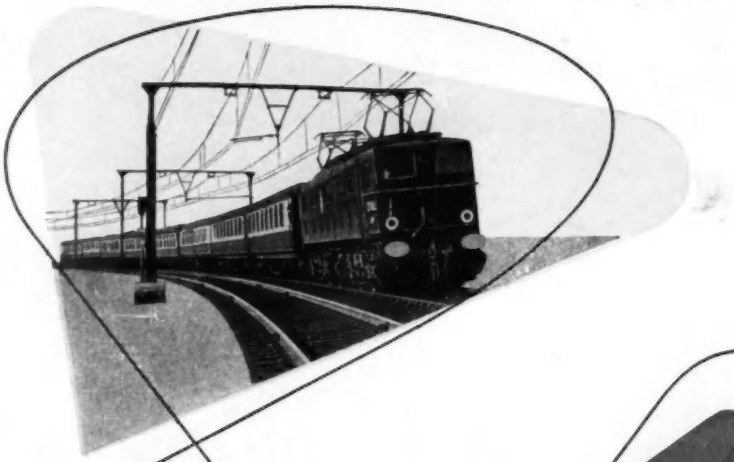

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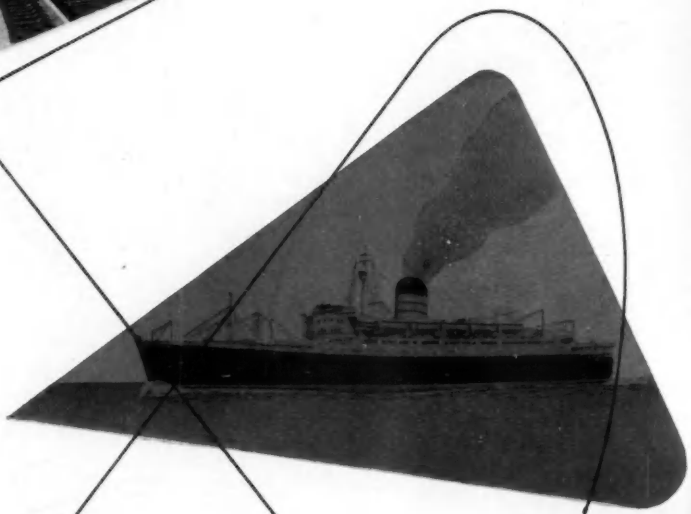

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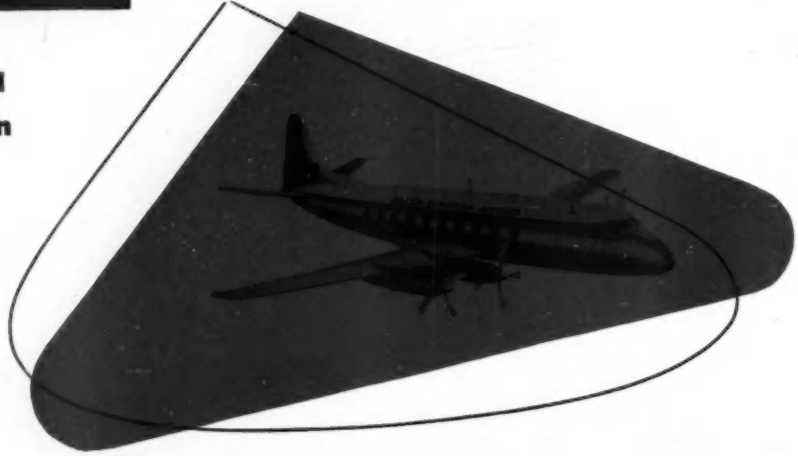

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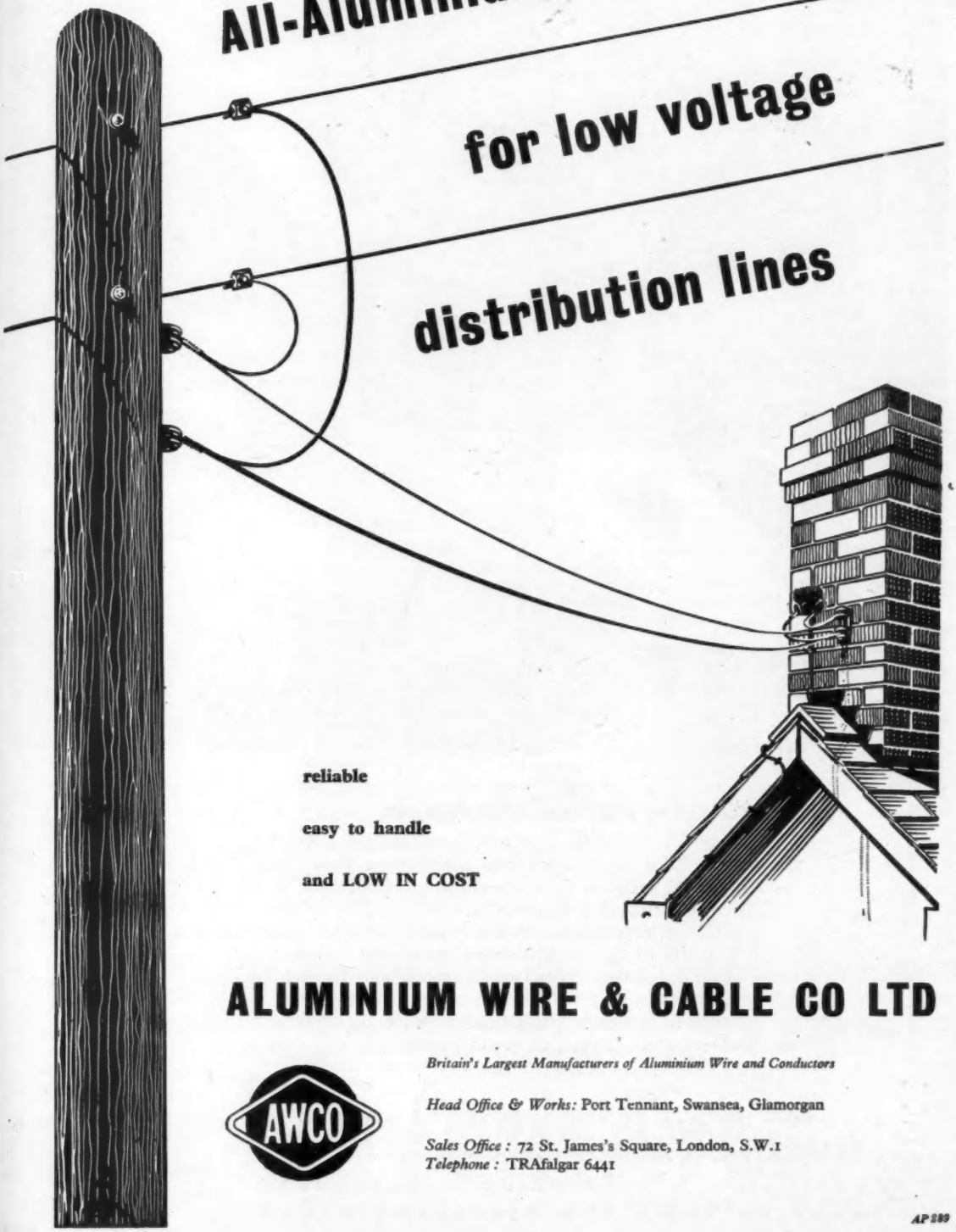

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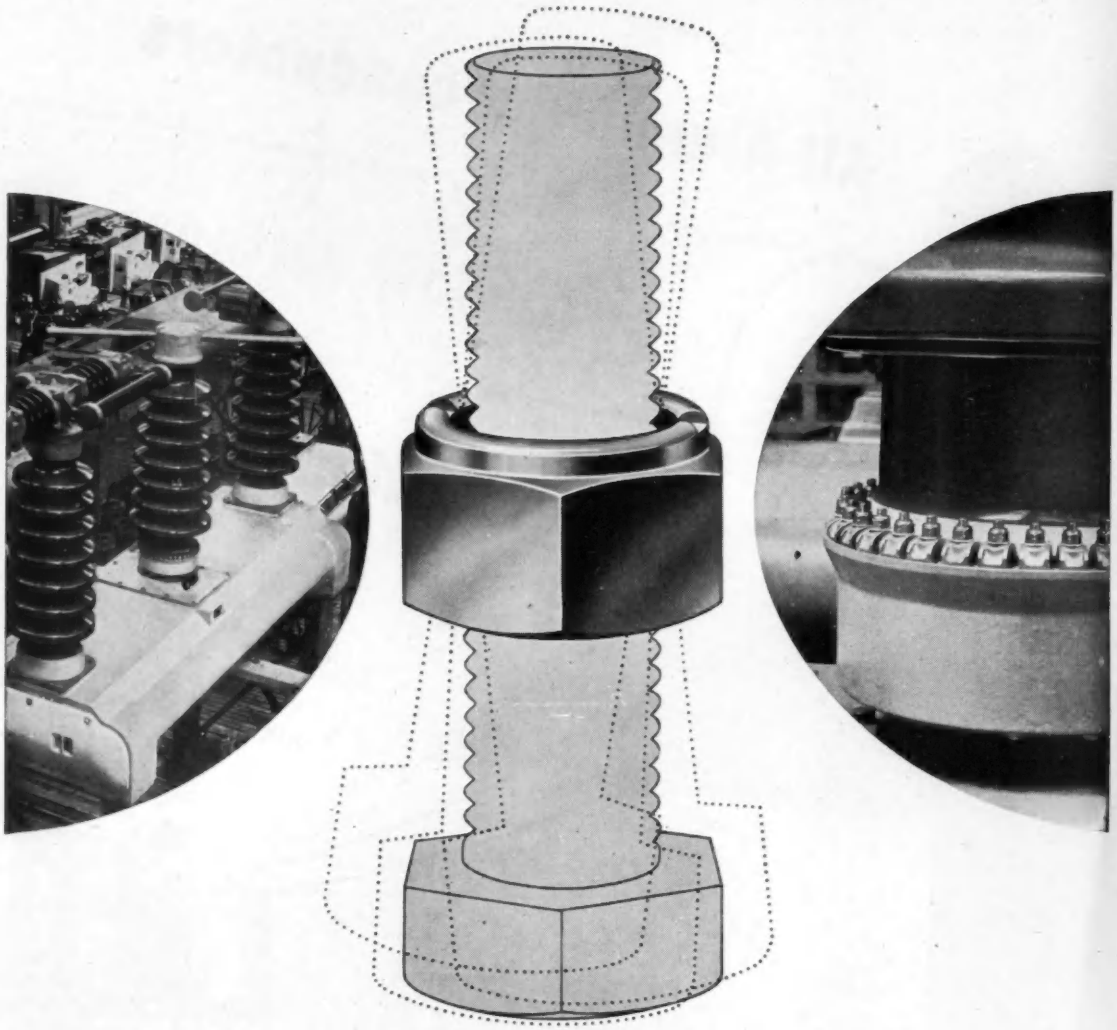

Nothing rattles the Nyloc

Tough nuts, these Nylocs! Rock them, shock them, vibrate them —nothing but a spanner works them loose. Metropolitan-Vickers built this 132 kV. airblast circuit-breaker equipment for outdoor installation, in the sort of climatic conditions that would work any normal nut loose. Up to 48 Nylocs are used around the base of each porcelain insulator. They keep a firm hold and ensure a watertight seal around the porcelain and along the stud threads.

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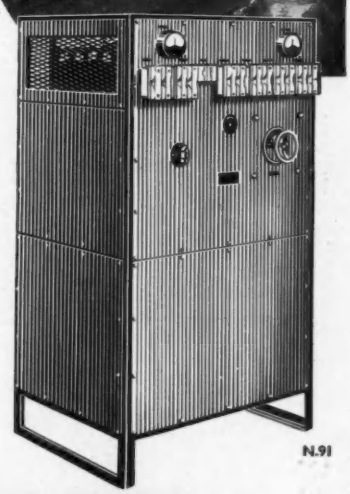

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YOU CAN BE CERTAIN TOO that Nife-Neverfayle Emergency Lighting Equipment will never let you down. *Whenever needed*, these reliable units will instantly, automatically spring into action. That is the special advantage of the Nife Steel Alkaline Battery—it never deteriorates, even after long periods of inactivity. Nife-Neverfayle units occupy only one-third of the space required by conventional equipment, and, as they can be installed adjacent to other equipment, a separate battery room is not needed — a point worth remembering when planning new buildings. Maintenance costs are negligible—after years of trouble-free service you will realise just how economical your Nife-Neverfayle equipment has been.

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THE EMERGENCY LIGHTING EQUIPMENT WITH THE **STEEL** ALKALINE BATTERY

NIFE BATTERIES · REDDITCH · WORCESTERSHIRE

MEM motor control gear helps to make so many things

This Wedgwood pottery for instance

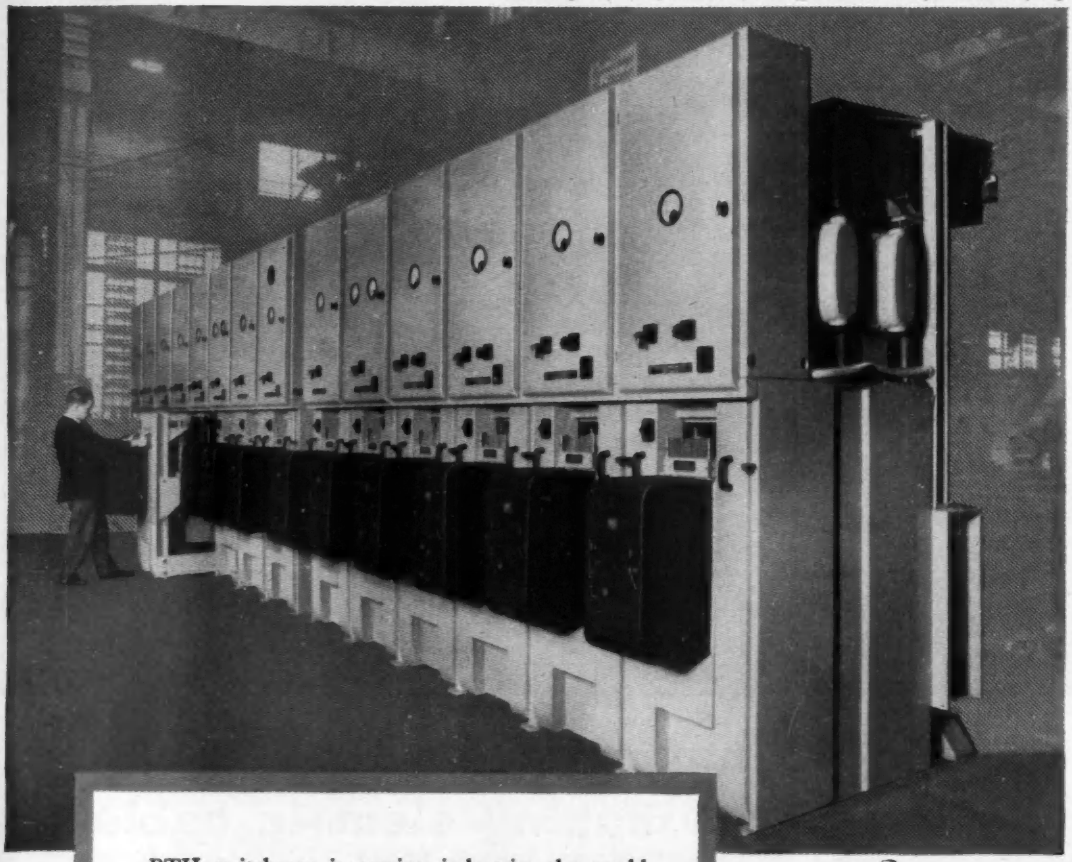
The new Wedgwood factory at Barlaston proves that pottery manufacture need not be accompanied by smoke and dirt. Built in a country setting, it is the first all-electric pottery in Great Britain. Here you will find plenty of MEM motor control gear and switchgear. Most of the leading industrial concerns are big users of MEM equipment. This is not surprising when you remember that MEM are leaders in their own electrical field too. MEM equipment is very simple and robust in design. It is extremely reliable in performance, easy to maintain and offers today's best value for money.

These polishing machines at the Wedgwood pottery are controlled by MEM motor starters. Note the MEM fuseboard on the wall in the background.

MEM MIDLAND ELECTRIC MANUFACTURING CO. LTD · TYSELEY · BIRMINGHAM 11

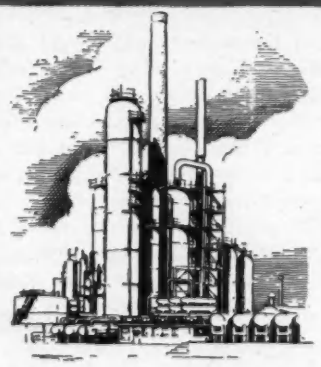
SWITCHGEAR FOR INDUSTRY

Fourteen-panel, 11-kv, 500-MVA, Class QF10 switchboard for Kuwait Refinery



BTH switchgear is serving industries the world over. A typical installation is at the Kuwait Oil Company's Refinery, for which eighty metal-clad equipments have been supplied to the order of E. B. Badger & Sons and G. Wimpey & Co.

BTH switchgear in the installation includes: thirty-three 11 kV, 500 MVA double-bus equipments and forty-seven 3.3 kV, 100/150 MVA single-bus equipments.



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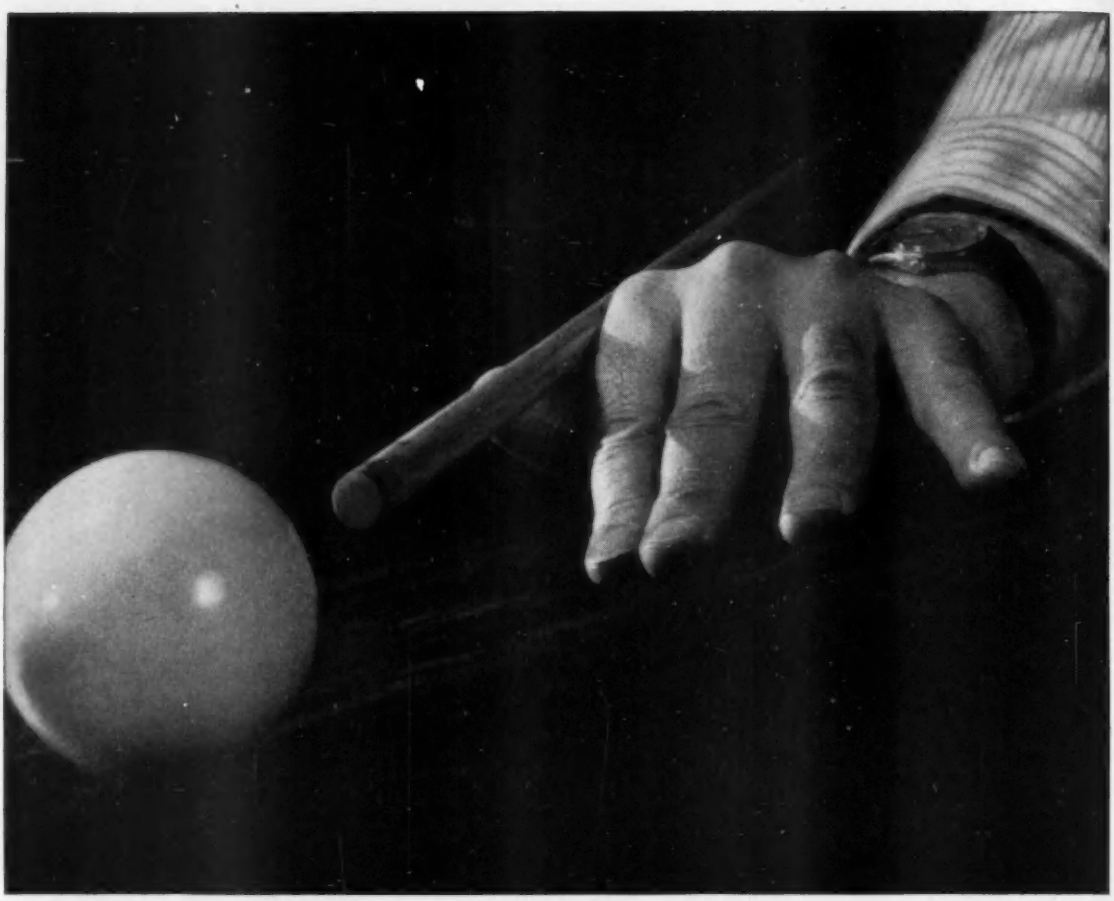

A kind of mathematics that plays a part in making electric cables.

Given the elasticity and weight of the balls, the resilience of the cushion, the rolling friction of the cloth, it must be possible for a billiards player to calculate exactly where and how hard to strike the cue ball. But you never see him doing sums. Somehow his knowledge is instinctive, the result of much experience.

Similarly it ought to be possible to specify a product such as cable. Perhaps it is. But in practice, as everyone knows, it doesn't work like that: manufacture involves hundreds of decisions that are made on experience. Like the expert billiards player, a Company with years at the job is able to sum up rapidly and almost unconsciously the combined effect of a large number of variables: it has, in fact, something analogous to his 'skill', which comes out in the quality of its products.

That's why the name on a product can mean so much.

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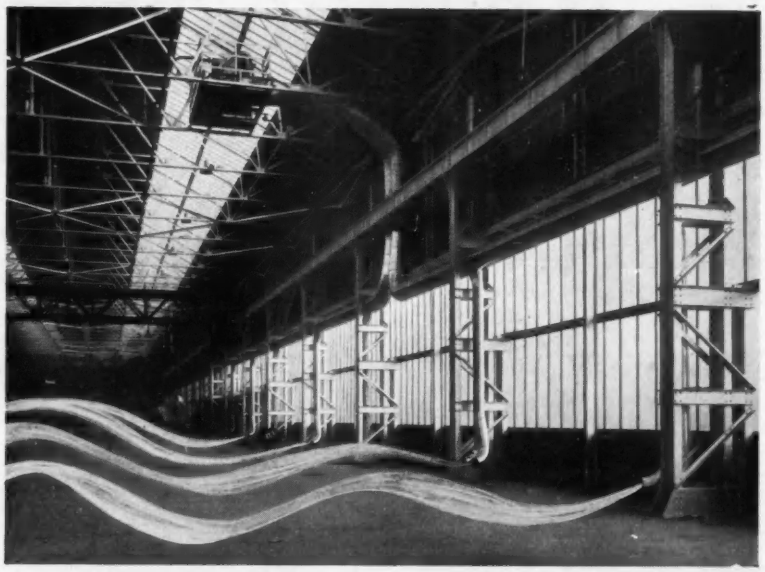

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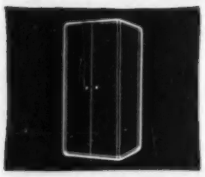

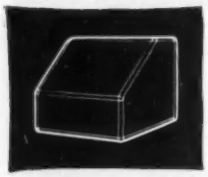

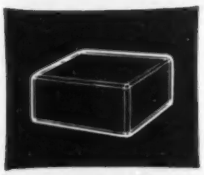

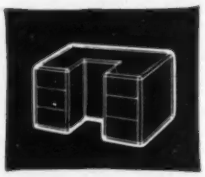

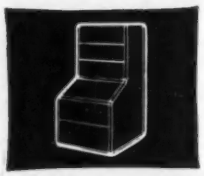

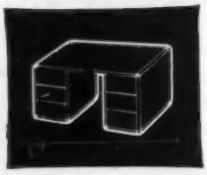

See what you can do with the unique Imlok system—*think* how it can save you money. Precision cases, cabinets, and other structures can all be quickly built to your own design—and using unskilled labour. The system is ideal for research and prototype work as well as for production runs. Various corner connectors and strong, light alloy extrusions lock together to form the framework required. Where fixed panels in the sides, top, back and base are required, they are retained in a groove in the extrusion specially designed for that purpose.

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The Imlok extrusion is now available in five alternative strengths to suit almost every application, and the extended range of components means unlimited scope in shapes and sizes. Special jigs for quick, accurate cutting and filing also supplied. May we send more details?

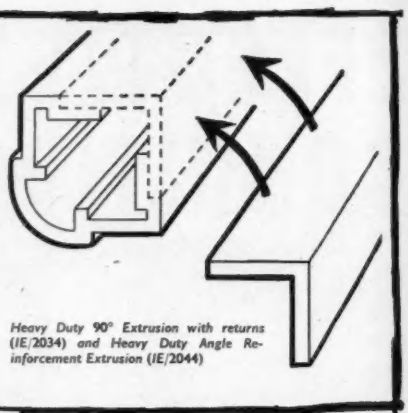
IMLOK

Economical, too!

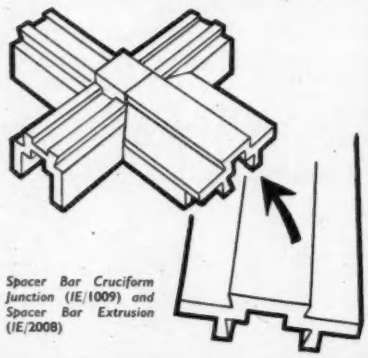
The material's cost of the framework for this Heavy Duty Double Bay Rak, size 6′ x 3′ 6″ x 1′ 9″, using the Heavy Duty components illustrated, is little over £30.

Using general duty components, i.e., IE/1001 90° Casting, IE/2024 90° strengthened Extrusion, IE/1004 Spacer Bar Casting, IE/2008 Spacer Bar Extrusion and IE/1009 Cruciform Junction, the material's cost for the framework only is just under £20.

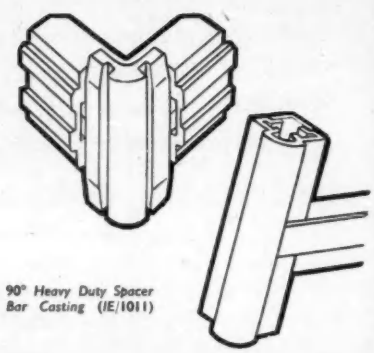
ALFRED IMHOF LIMITED Dept. D2
112-116 New Oxford Street London WC1 Tel: MUSeum 7878



Heavy Duty 90° Extrusion with returns (IE/2034) and Heavy Duty Angle Reinforcement Extrusion (IE/2044)



Spacer Bar Cruciform Junction (IE/1009) and Spacer Bar Extrusion (IE/2008)



90° Heavy Duty Spacer Bar Casting (IE/1011)

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cannot "fail to danger"

Extract from the Factory Inspectors Report 1955*:*

"With the growing use of automatic controls, more and more limit switches are employed. Designers of these do not always consider the consequences of 'failure to danger', which can easily occur with most types through the development of a small defect. The consequences of such failure are of the greatest importance where the limit switch is introduced to guard a dangerous part of machinery or plant.

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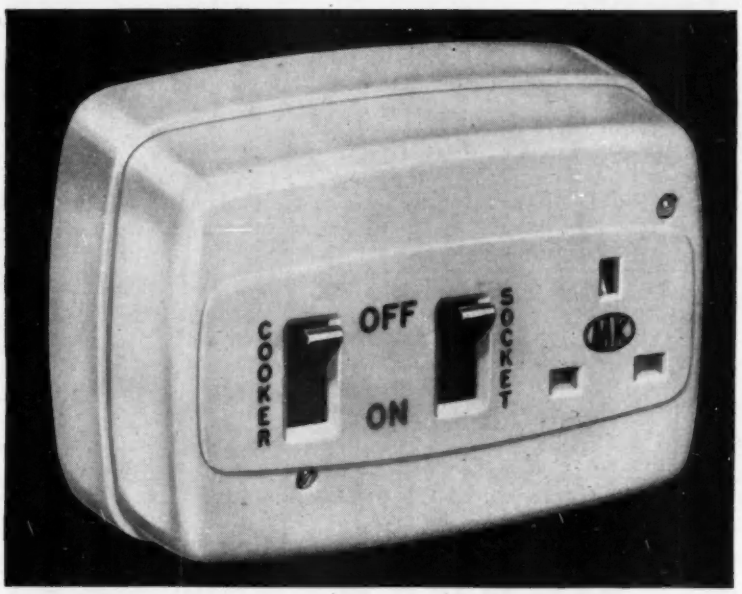
FOR SURFACE INSTALLATIONS this new all-insulated cooker control unit is extremely neat and compact. It has a tough, easy-to-clean case moulded in ivory of urea formaldehyde, and the switch handles are red in contrast. A self-contained mounting block is provided so that the unit can be fixed direct to the wall, and the cables are housed in an incombustible compartment with good entry facilities. The unit is designed for straight-through wiring and earthing. Maximum dimensions across the base are $5\frac{7}{8}$" x $4\frac{1}{4}$".



List No. 5040/646 *30 amp double pole AC surface cooker control unit with 13 amp double pole switchsocket-outlet, all-insulated pattern, ivory finish. Complete with ivory 13 amp fused plug,* **27/8** *each*

Also available with twin neon pilot-lights, **List No. 5041/646.** *Complete with two lamps and ivory 13 amp fused-plug.* **36/6** *each*

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All cables manufactured by General and Britannic conform to the relevant requirements of the British Standards Institution.

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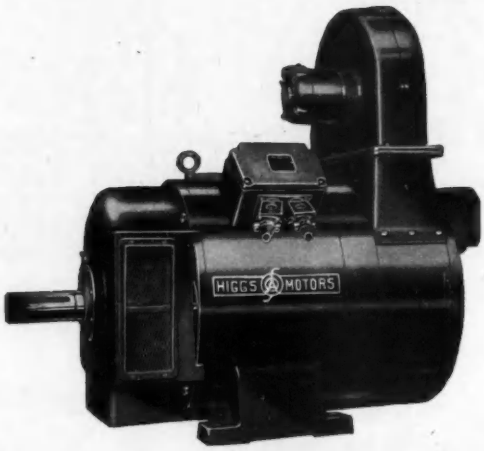

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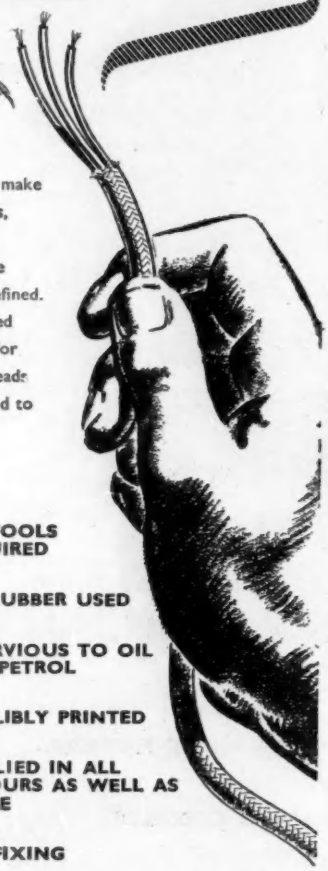
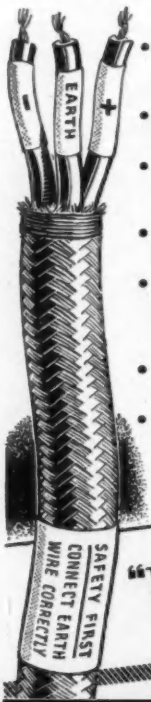


To follow the "Safety First" recommendation, make sure your electrical leads, whether to Domestic Appliances or to Machine Tools, etc., are clearly defined. "Viskrings" simply slipped over the core-wires and/or the outer casing of the lead: do the job and put an end to confusion or doubt.



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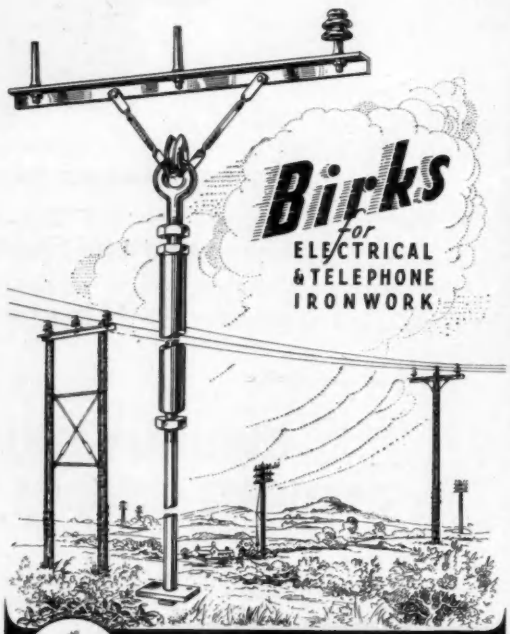

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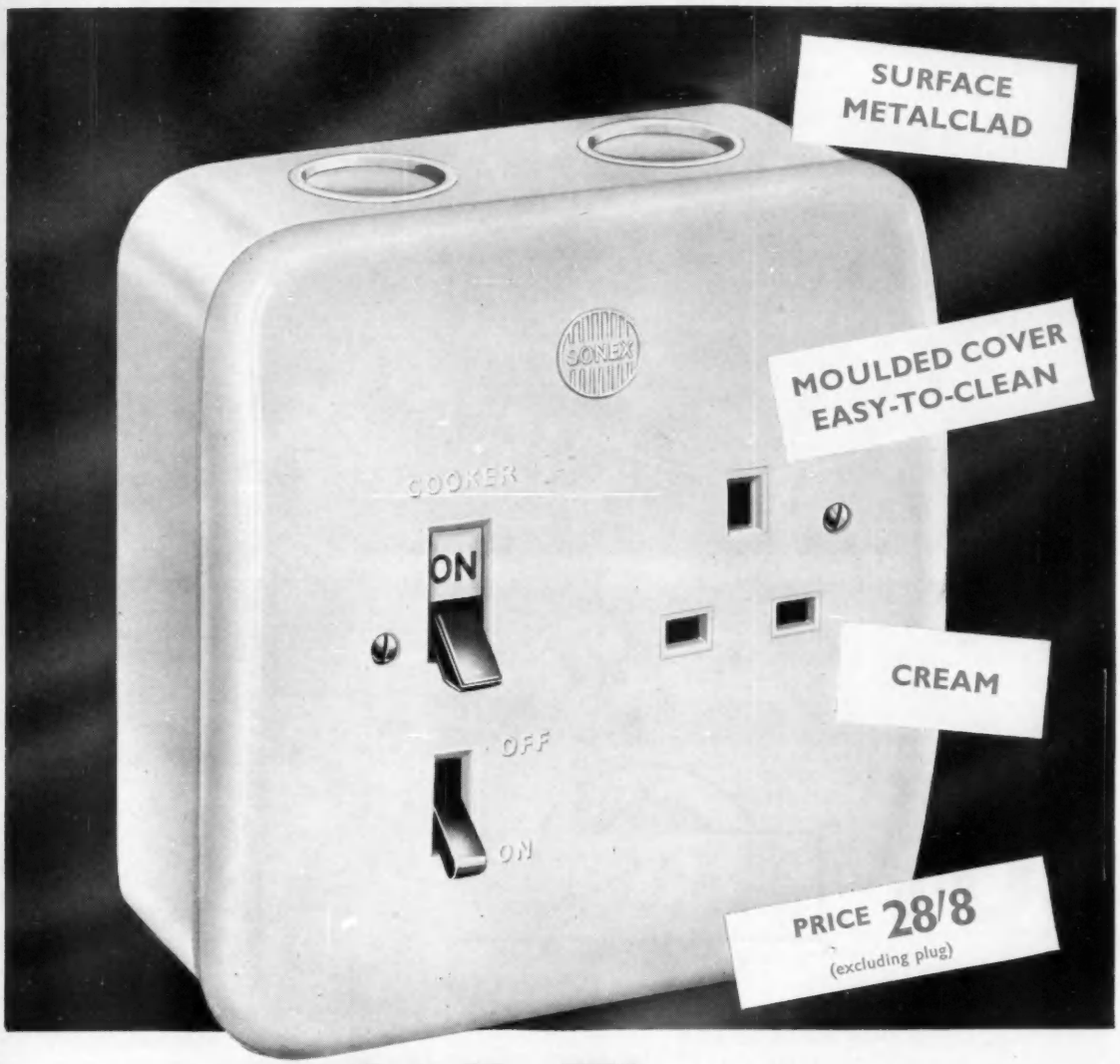

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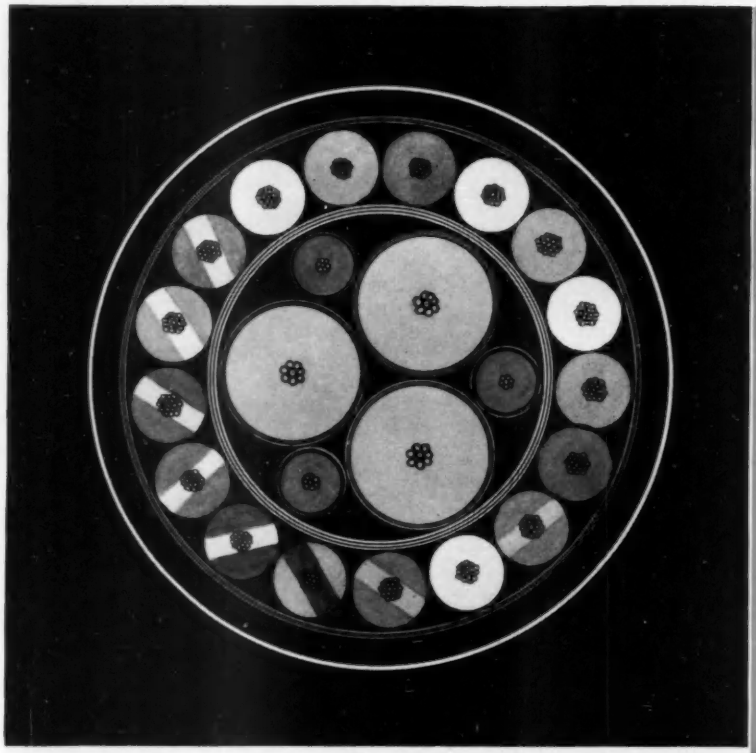

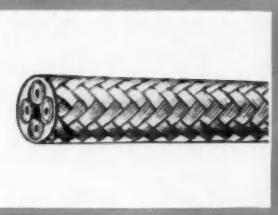

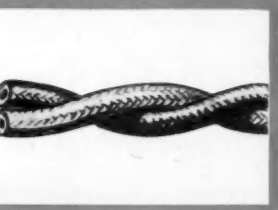

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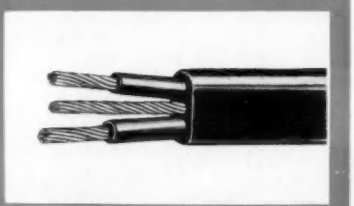

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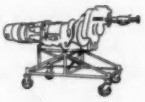

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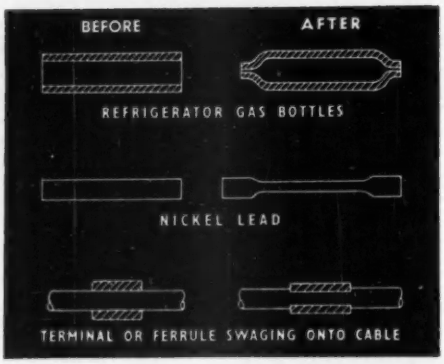

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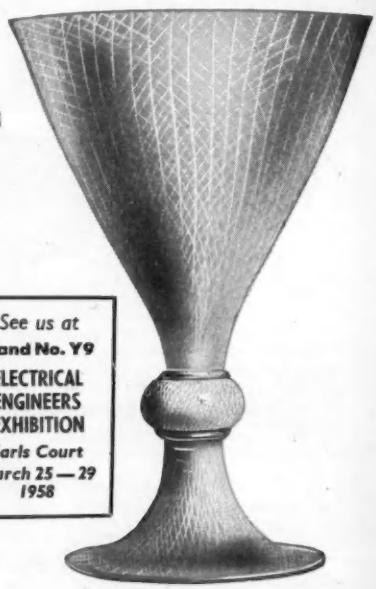

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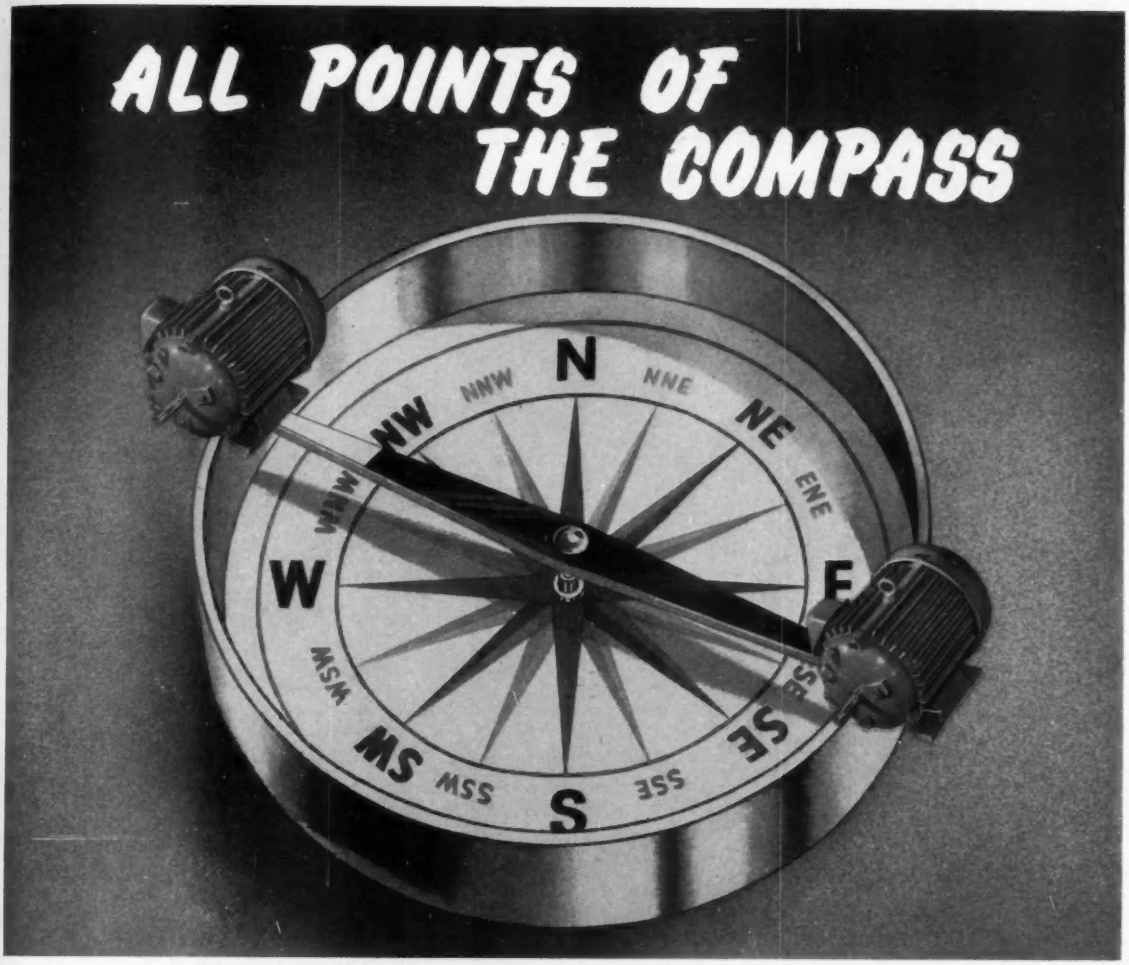

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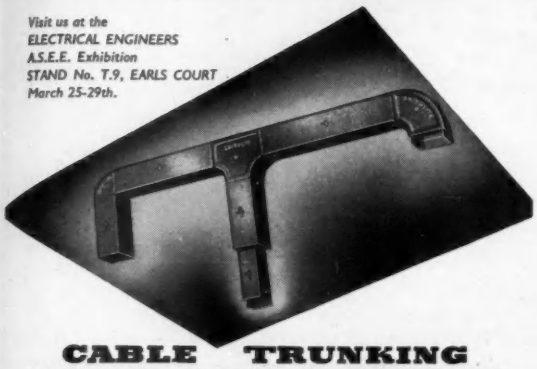

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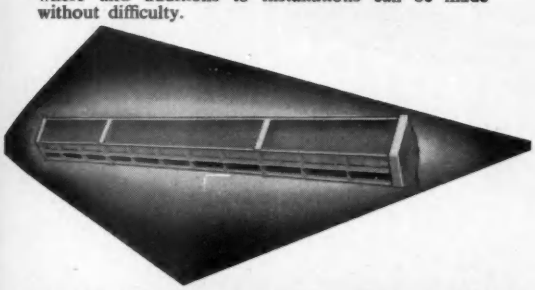

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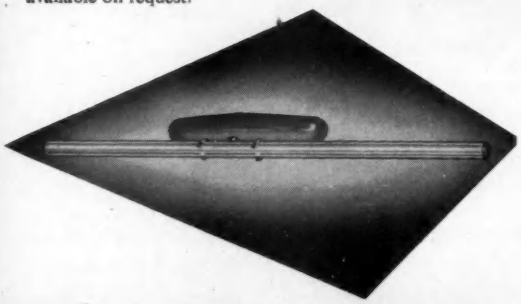

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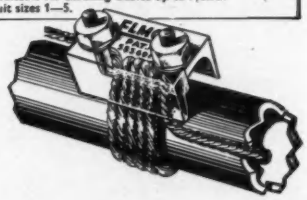

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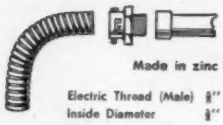

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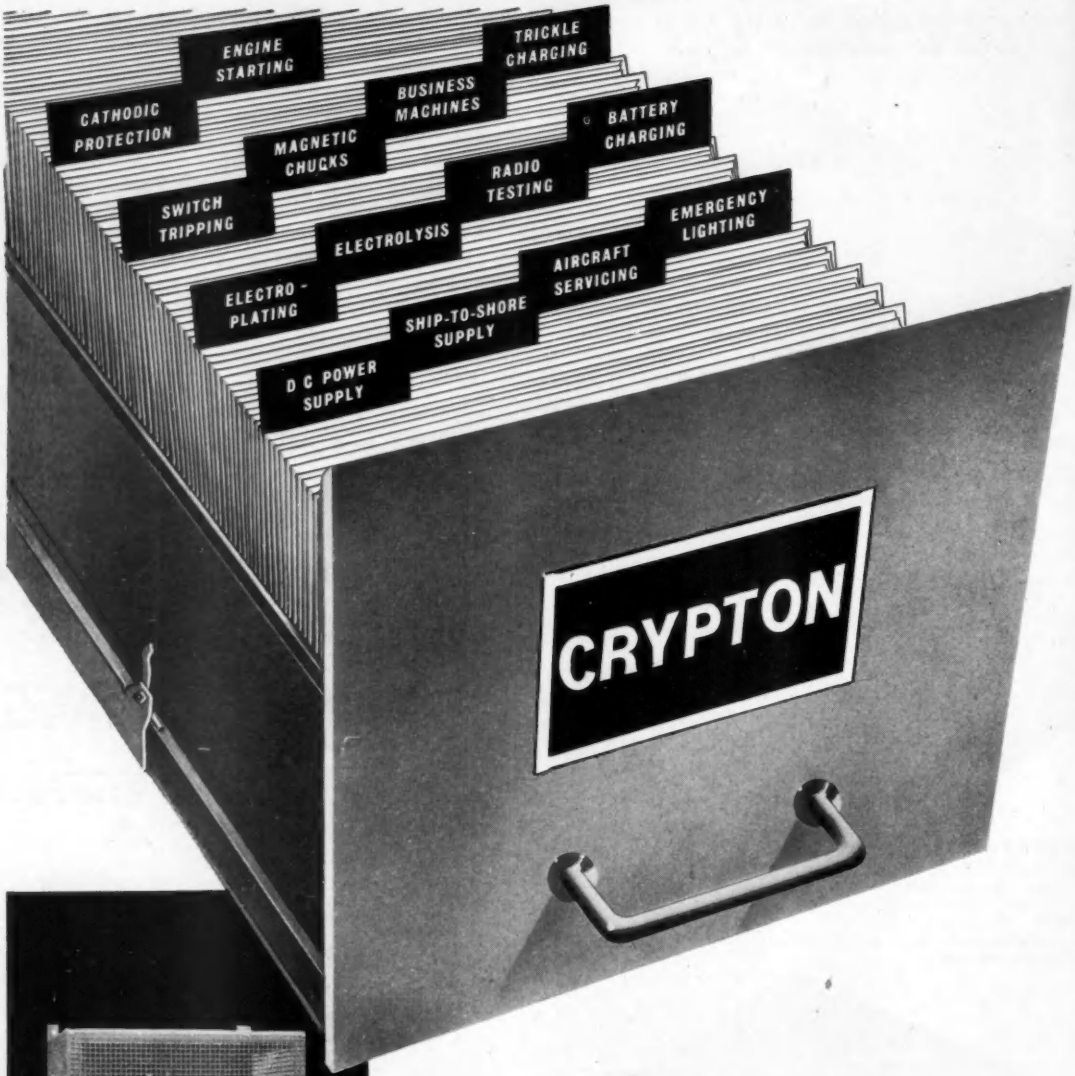

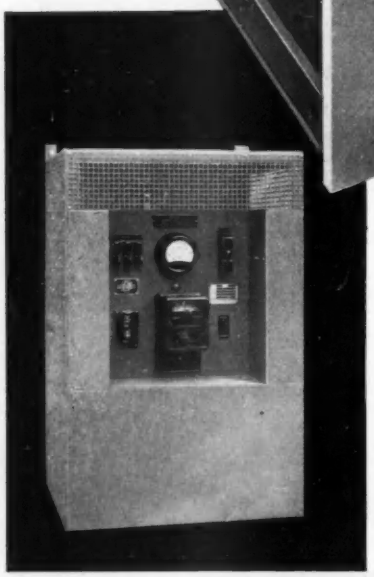

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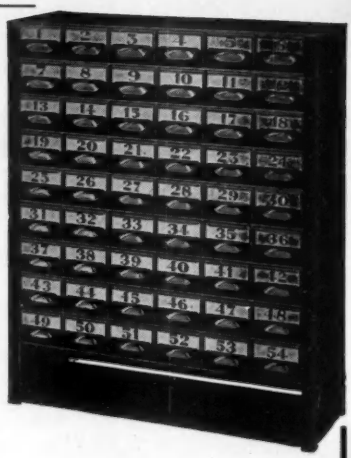

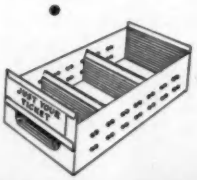

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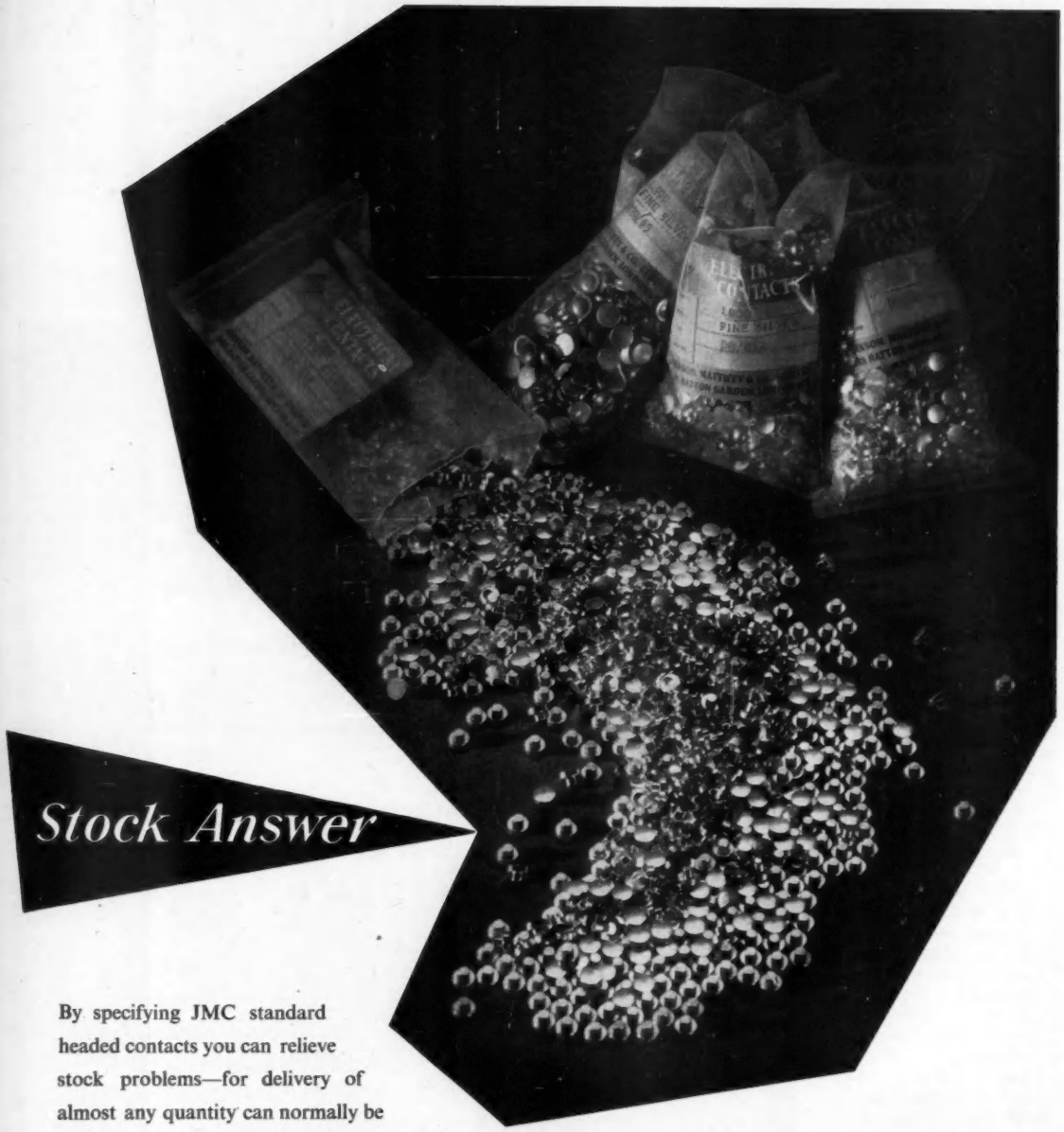

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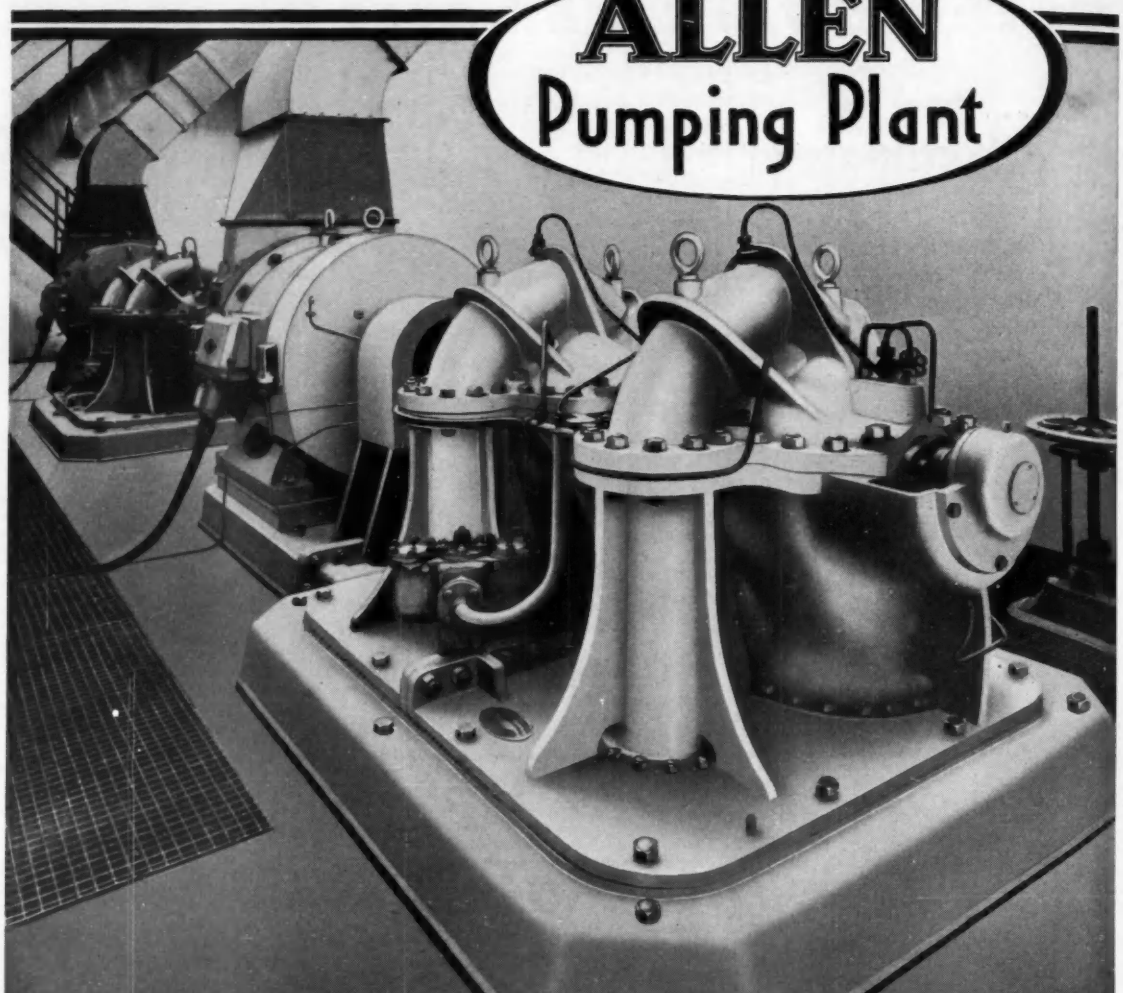

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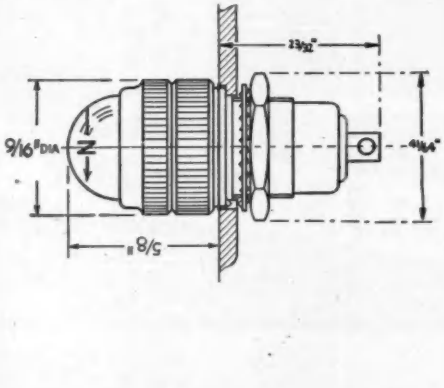

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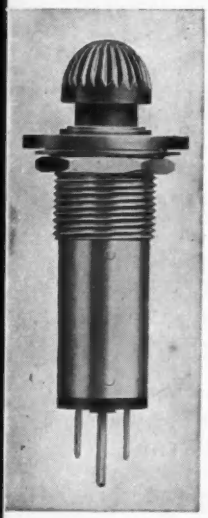
FITTING



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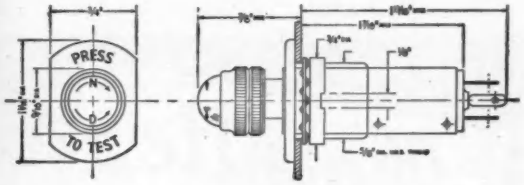

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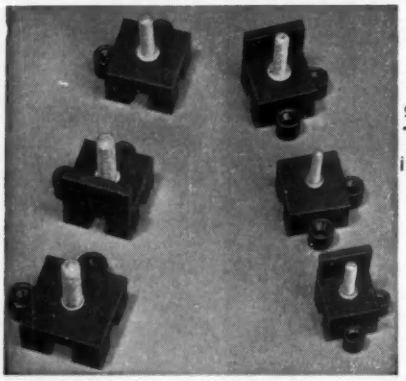

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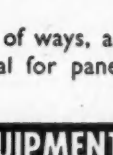

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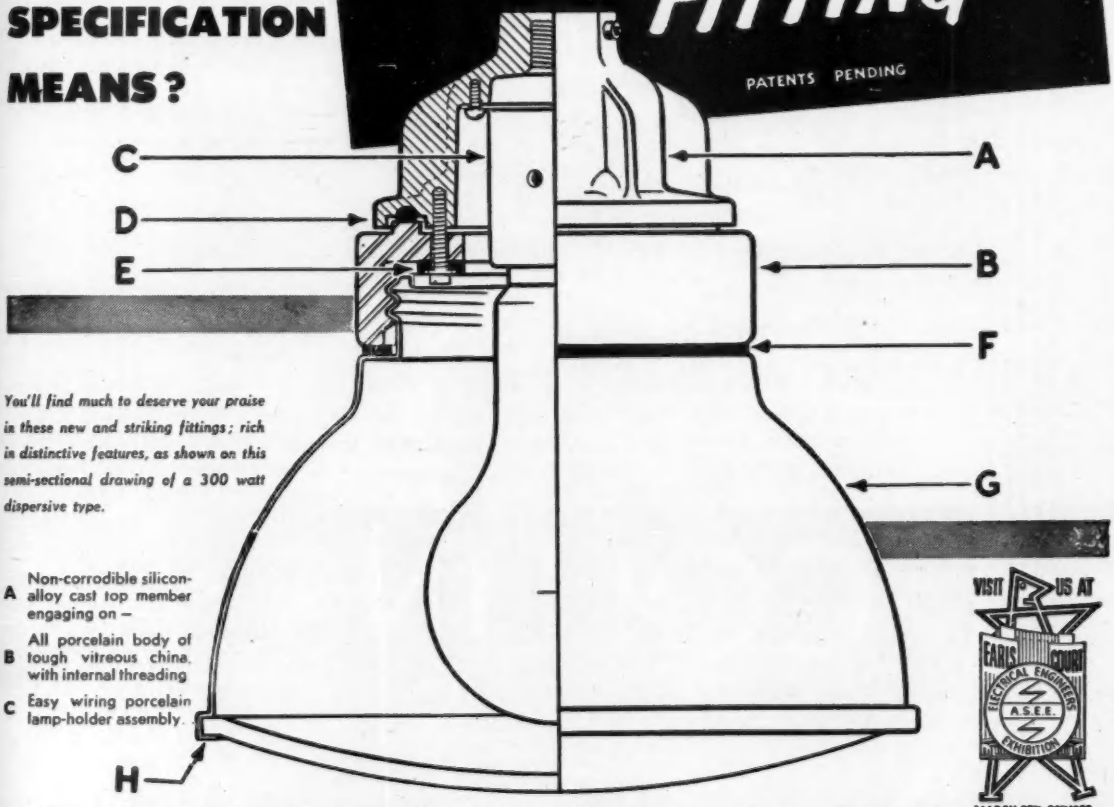

You'll find much to deserve your praise in these new and striking fittings; rich in distinctive features, as shown on this semi-sectional drawing of a 300 watt dispersive type.

A Non-corrodible silicon-alloy cast top member engaging on –

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C Easy wiring porcelain lamp-holder assembly.

D Gastight and dust-tight joint between top member and porcelain body.

E Silicon-alloy supporting ring reinforcing 3-point fixing of porcelain body to top member.

F Bonded cork gasket providing positive joint between porcelain body and –

G Screw neck reflector of heavy gauge aluminium, specially treated.

H Heavy section pressed heat-resisting glass dome, permanently sealed in position at mouth of reflector.

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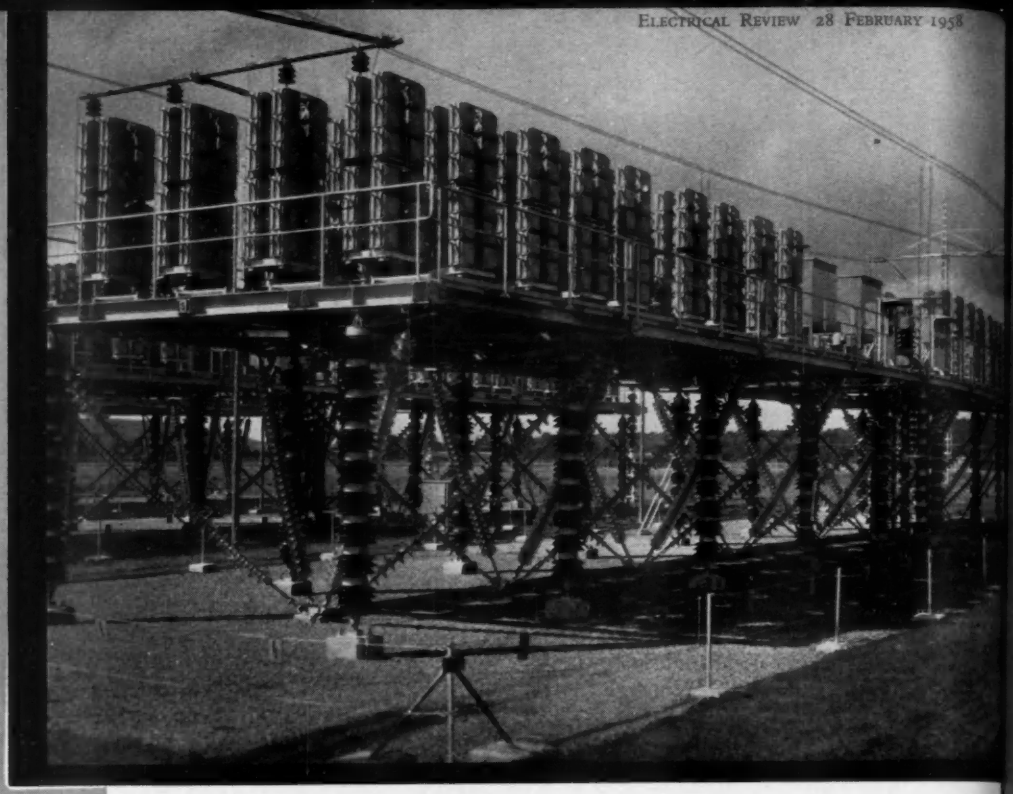

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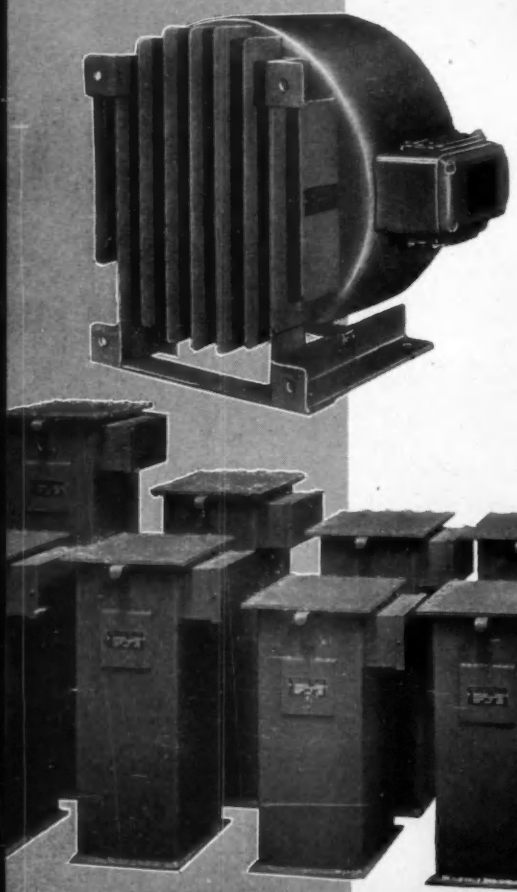

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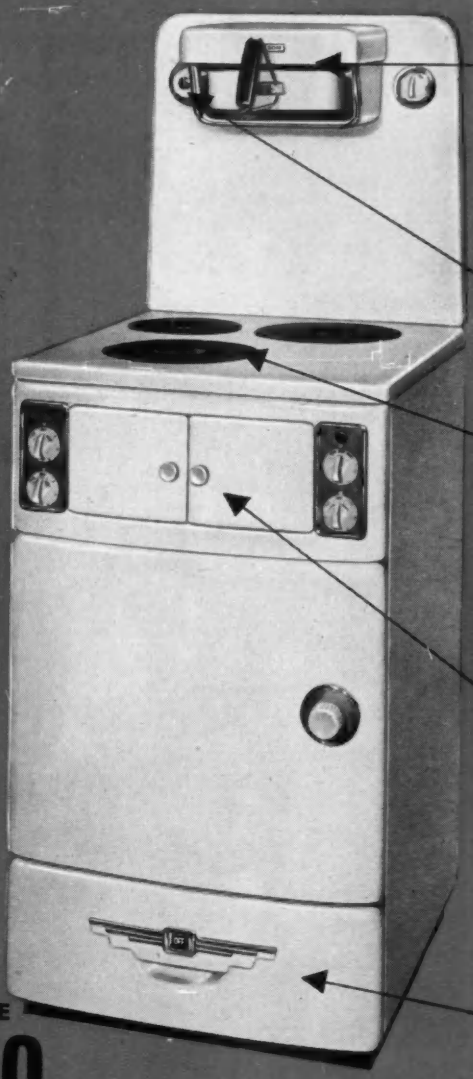

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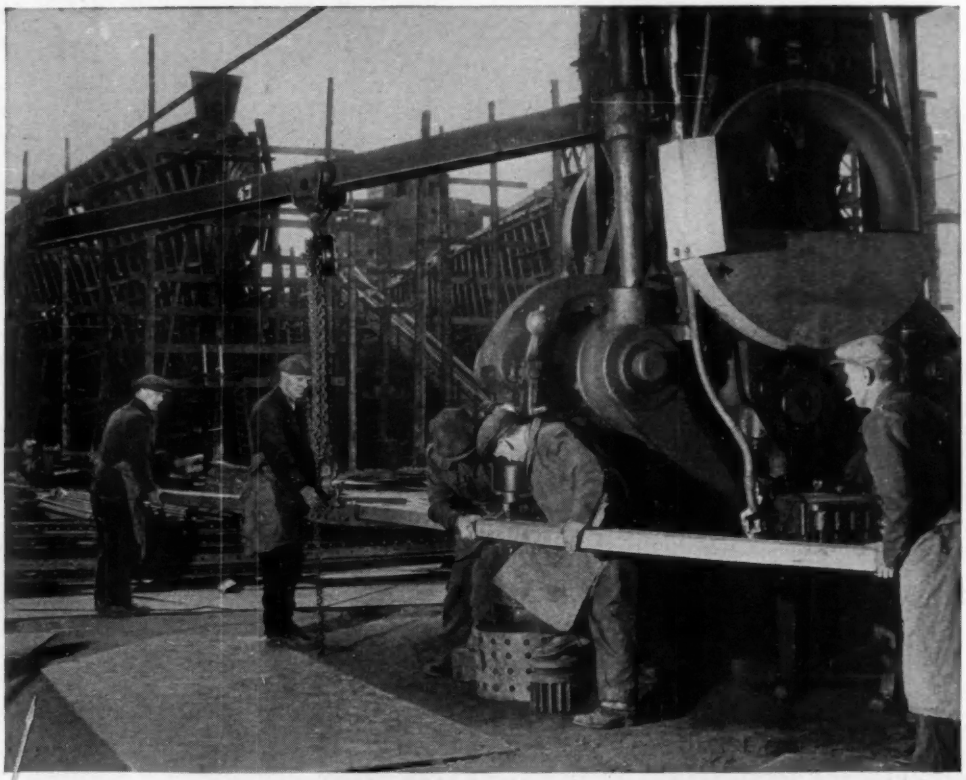

Building a ship. Rivet holes are being punched in the frames to match the holes which will be punched in the shell.

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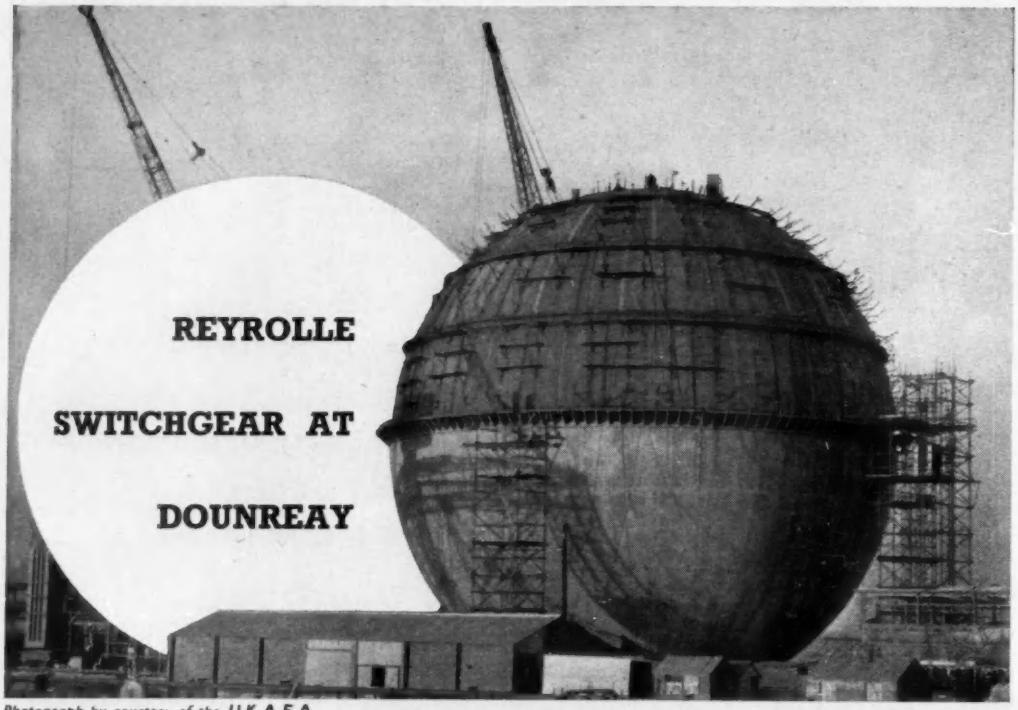
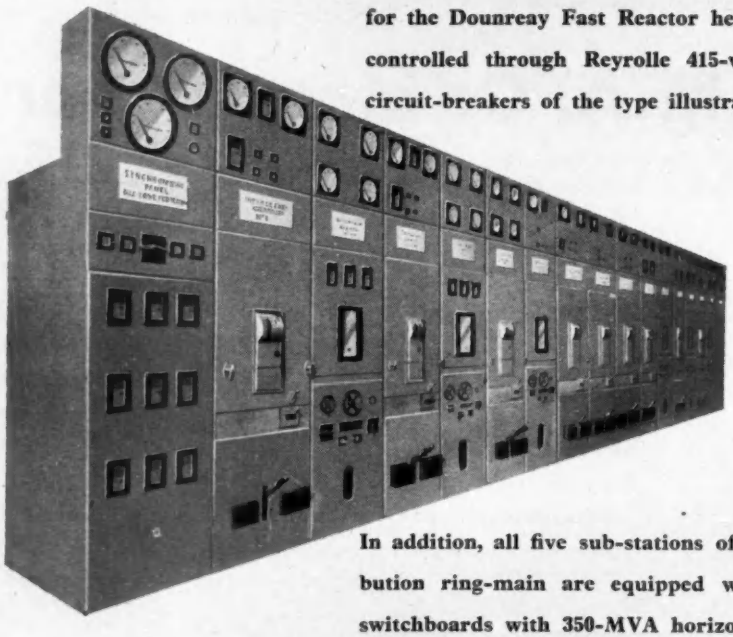


Photograph by courtesy of the U.K.A.E.A

The electro-magnetic liquid-metal pumps and other services for the Dounreay Fast Reactor heat-exchanger system are controlled through Reyrolle 415-volt 31·5-MVA air-break circuit-breakers of the type illustrated.



17-panel switchboard comprising Reyrolle type-S22A air-break circuit-breakers with associated control cubicles.

In addition, all five sub-stations of the main 11-kV distribution ring-main are equipped with Reyrolle metalclad switchboards with 350-MVA horizontal draw-out oil-break circuit-breakers.

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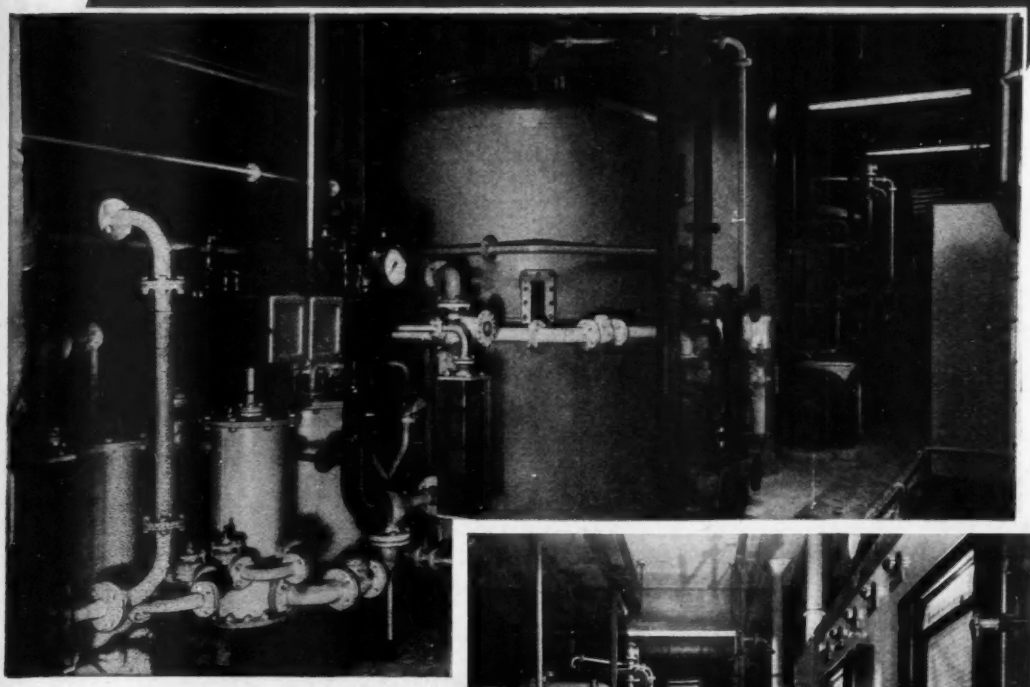
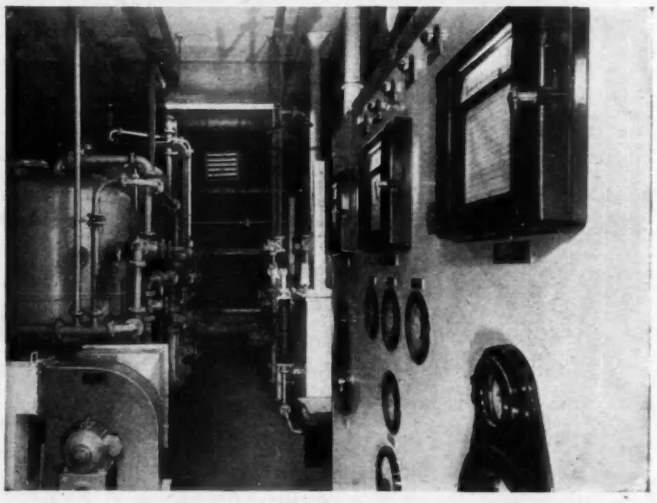
WATER TREATMENT BY DE-IONISATION





John Thompson-Kennicott de-ionisation plant at the North Wilford Power Station of the Central Electricity Authority producing 75,000 gallons of treated water in 14 hours for high pressure water tube boilers from Nottingham Corporation Town supply, consisting of:

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Weakly basic Anion Exchanger.
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TOTAL DISSOLVED SOLIDS	RANGING FROM 587—638 p.p.m.	IMMEASURABLE
ELECTRICAL CONDUCTIVITY	660	0·1—0·2

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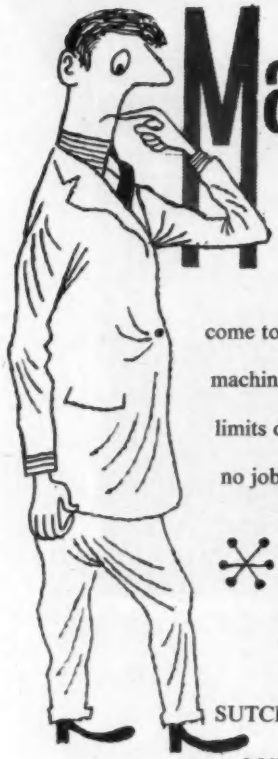

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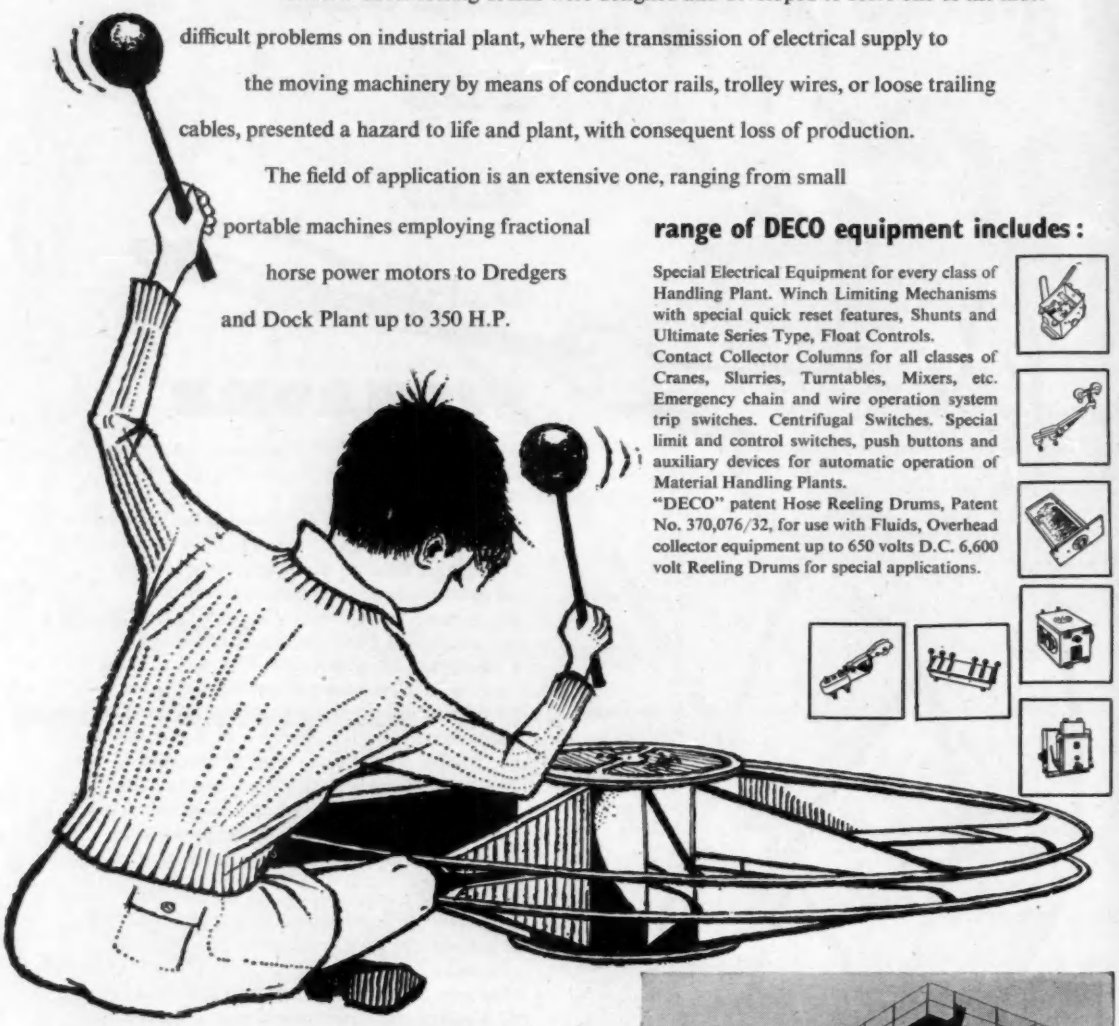

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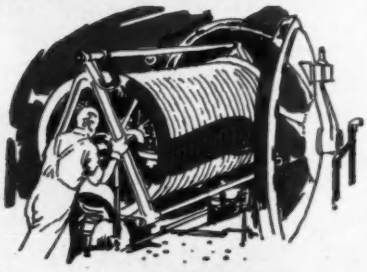

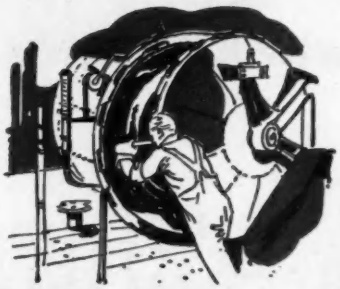

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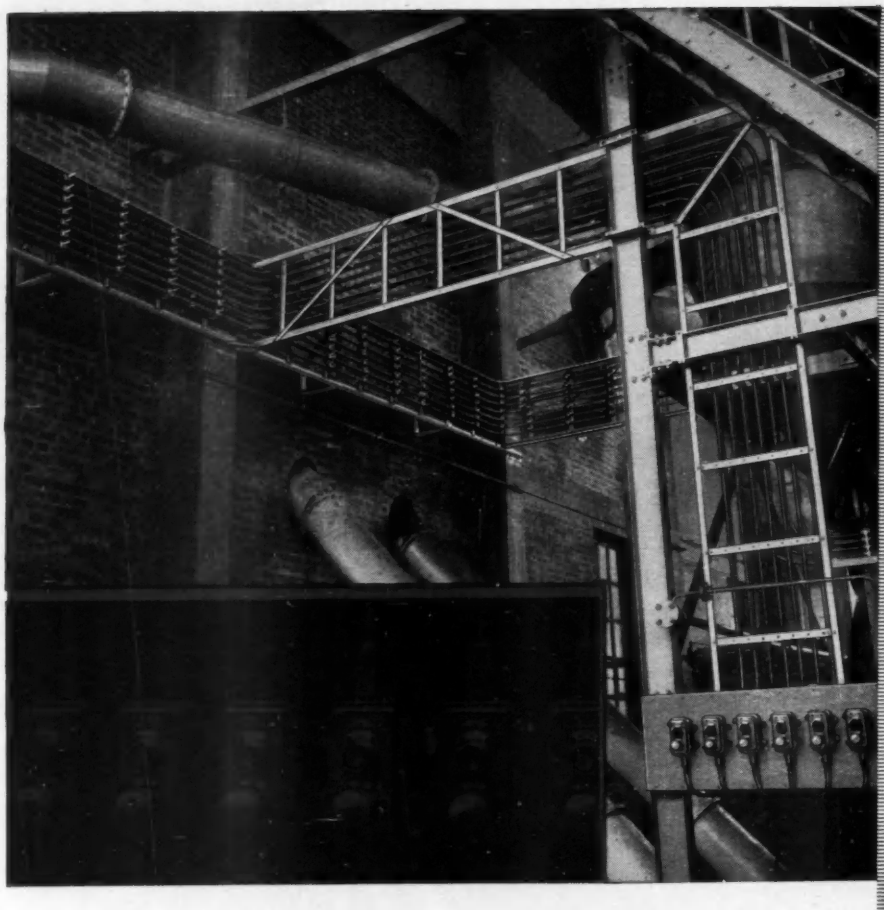

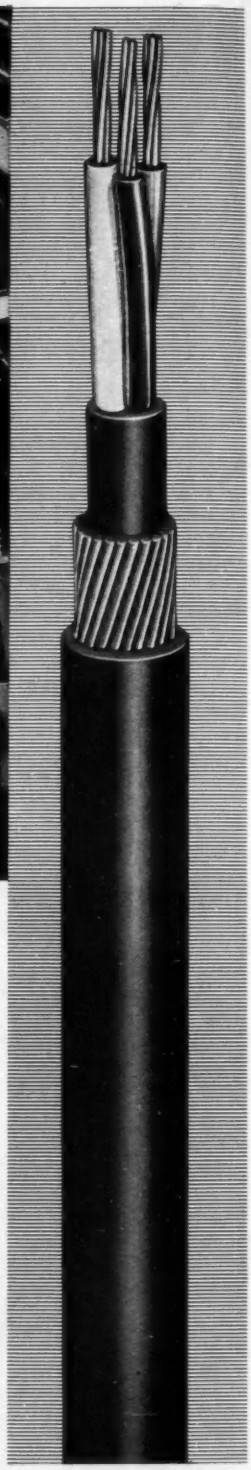

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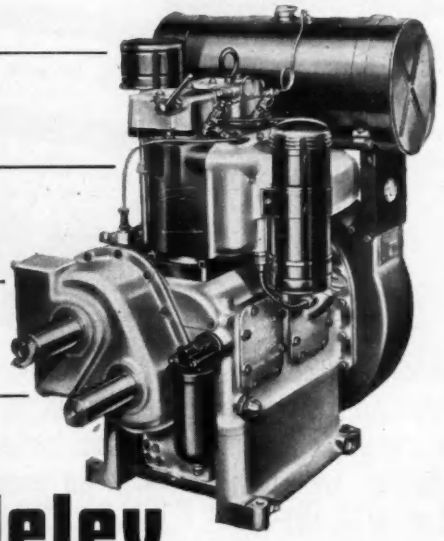

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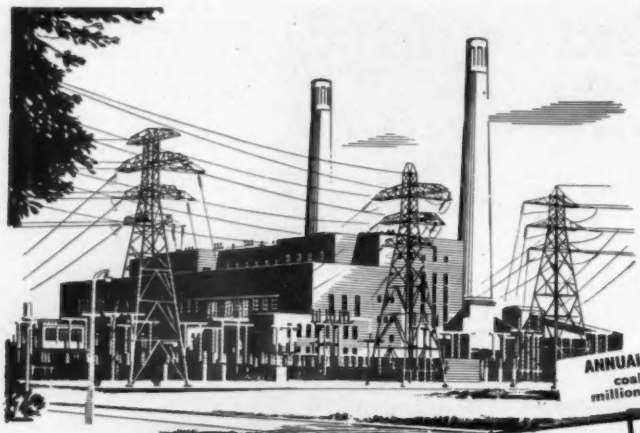

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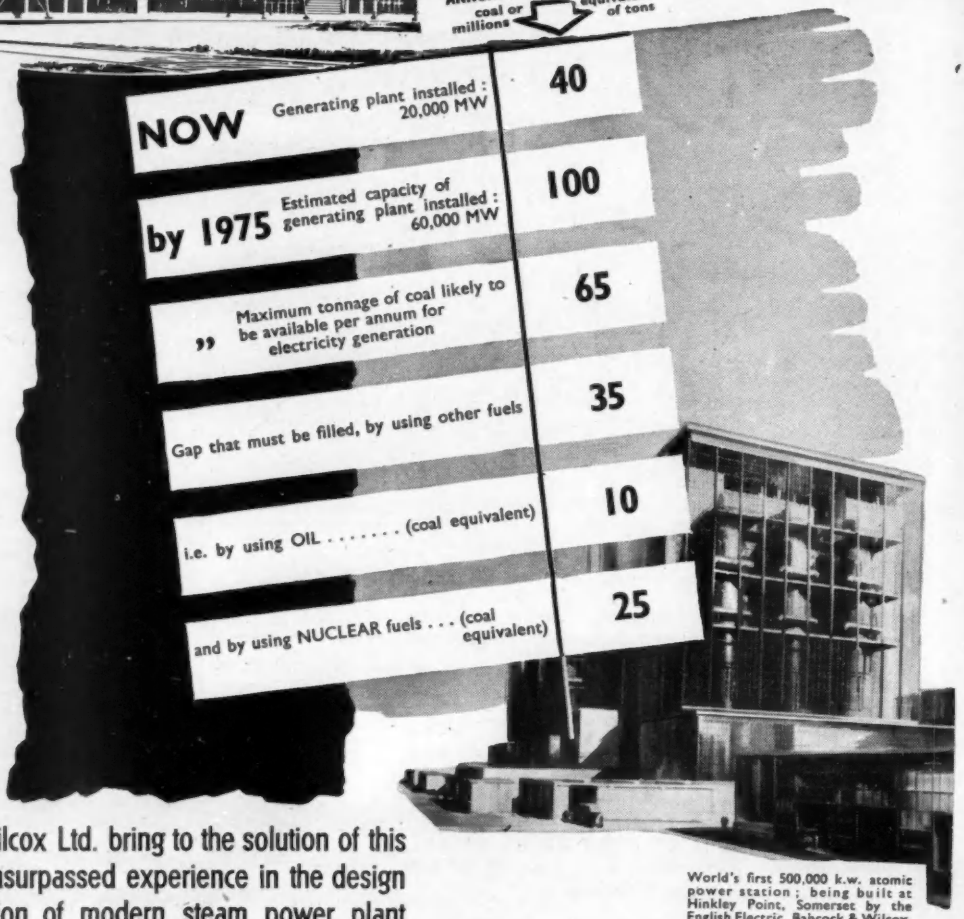
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equivalent of tons
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by 1975
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100
"
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Gap that must be filled, by using other fuels
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ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

Purchase Tax and Exports 377
Domestic electrical appliances are not luxuries, and attention is drawn to the ways in which the present high rates of purchase tax are hampering manufacturers in their efforts to increase exports. The Government is urged to spread purchase tax more equitably or replace it by a sales or turnover tax

Automatic Circuit Reclosers 379
The author thinks that, considering the fact that auto-reclosers of British manufacture have been available only since 1955, the increase of such installations on one system from 16 in early 1956 to 63 in the autumn of 1957, with the prospect of 60 more by this spring, is satisfactory progress

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British electrical exports in January, at £20 million, were substantially greater than in the corresponding month of last year, heavy electrical equipment in particular showing a marked advance

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The general layout of the South of Scotland Electricity Board's nuclear power station is now becoming clear; foundation work is well ahead

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This year's Melchett Lecture to the Institute of Fuel was given by Sir Christopher Hinton, chairman of the Central Electricity Generating Board and formerly managing director of the Industrial Group of the United Kingdom Atomic Energy Authority, who traced the development of the U.K.A.E.A. to its present position of world leadership

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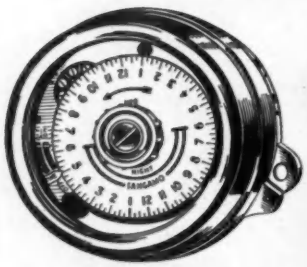

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ELECTRICAL REVIEW

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Purchase Tax and Exports

WHEN purchase tax was introduced early in the war it was accepted as a convenient and efficient means of reducing the demand for consumer goods. Being levied on a wide range of commodities and, for the most part, at a single rate of one-third the wholesale value, the tax was both equitable and simple to collect. Over the past 18 years the rates have been increased on certain products to punitive levels and the schedules have become progressively more complex and anomalous. Though successive Chancellors of the Exchequer have justified these changes as necessary to influence particular forms of consumption or to divert goods into overseas markets, purchase tax has now become essentially a method of raising revenue. In the last financial year it netted £458 million for the Exchequer.

Much attention is being directed in Parliament and the Press to the "lunatic fringe" of anomalies with which the schedules abound. It would be a pity however if this were to detract from the desirability of reducing the level of tax on domestic electrical appliances. Not only is it retrograde to impose a far higher charge on modern labour-saving appliances than on the old-fashioned methods that they replace, but it is difficult to see how a washing machine or a refrigerator (60 per cent) can be considered as more of a luxury than a carpet (15 per cent) or a hotwater bottle (exempt).

In the present economic circumstances the curbing of home demand could be justified if it served to secure a high level of exports. With purchase tax the reverse is true. Though the high proportion of the total production of domestic appliances that goes overseas is evidence of the energy and enterprise of manufacturers, total exports of domestic appliances have remained almost static for several years. The growth of local manufacture and foreign competition has made overseas buyers increasingly selective and price conscious. With domestic appliances, especially those like refrigerators where tooling costs are high, considerable economies can be obtained from large-scale production. But such production, with its benefit of lower prices, can only be embarked on if supported by a large and predictable home demand. Production facilities which were expanded when credit restrictions were eased in 1954 are now under-employed.

Germany has an unrestricted home market and the production of domestic appliances has accordingly grown from virtually nothing ten years ago to two or three times the British figure. Germany has also now passed Britain as an exporter of domestic appliances. She is in a strong position to exploit overseas markets because her exports form a much lower proportion of her total production. The individual

requirements of exporters can therefore be more economically catered for and changes in design, with their consequent expensive changes in tooling, are possible more frequently. The production of the more advanced appliances now demanded abroad is particularly hampered in Britain.

It would be unrealistic at the moment to expect any appreciable cuts in taxation. Nevertheless the present system of purchase tax is most unsatisfactory. The Government should therefore give immediate and serious consideration to the possibilities of spreading the present load more equitably or, perhaps, of replacing purchase tax by a sales or turnover tax designed to produce the desired revenue but levied widely at a very low rate. This would enable the public to exercise their preference for the more efficient appliances and be a welcome encouragement to a branch of the electrical industry that has suffered many setbacks since the war.

NATIONALISATION PROSPECTS

Sir Hugh Beaver, president of the Federation of British Industries, announced last week that he proposed to appoint a committee to examine nationalisation prospects and report its findings to the F.B.I. Grand Council. Sir Hugh said that repeated threats and counter-threats upon the subject were having disturbing effects upon many sections of industry. He distinguished between national common services and manufacturing industry and acknowledged that he had been impressed by the efficiency of the Central Electricity Authority, under Lord Citrine, when he (Sir Hugh) had been the chairman of the committee appointed to consider power station building costs.

We concur in Sir Hugh Beaver's distinction. As we have often said before, a case can be made out for State ownership of national services, such as railways, telephones, electricity and gas, which are purely, or overwhelmingly, internal matters. But manufacturing, for both home and export, is an entirely different business in which State control would be disastrous. The recurring threats to nationalise large sections of the engineering industry may have a political appeal but they entirely ignore realities.

REACTOR PLANT FOR JAPAN

Negotiations have been proceeding for some months between Japanese and British interests in connection with the supplying by this country of a Calder Hall type atomic power station to be erected about 70 miles from Tokyo. At one point it seemed that a decision had been reached but then doubts arose whether the reactor would be safe in the event of earthquakes to which the area is subjected from time to time. This question now appears to have been settled satisfactorily and last week it was announced that the Japanese Atomic Power Company was inviting tenders for a 150 MW station from three British groups. When it is settled the order will be the second of its kind for nuclear plant to be placed in this country, for last November a contract for a 200 MW station was awarded to the Nuclear Power Plant Co. by an Italian company.

The earthquake threat is apparently to be met by placing the whole of the installation upon a substantial reinforced concrete raft which it is thought will move as a whole in an earthquake. A specially-designed method of shutting down the reactor in an emergency is also envisaged.

RUN-DOWN SYSTEMS

Some anxiety is being caused by the number of deaths resulting from gas escapes, which totalled 572 in the year ended last September. Most of the fatalities appear to have been due to leaks from pipes which had been corroded through long years of service and should have been replaced before this. In this matter the Gas Boards are in much the same position as the Electricity Boards. A great deal needs doing to their distribution systems but it is difficult for them to meet the considerable expense involved.

But whereas in the case of gas defective distribution is invariably dangerous, inadequate or obsolescent electricity networks and services are more often the cause of inconvenience and annoyance than actual danger. Nevertheless, as we have often contended in the past, it will not do for too great a proportion of available funds to be spent on generating plant if the means of distributing electricity are not fully maintained and reinforced.

HEAT EXCHANGE SURFACE

The economic steam cycle of atomic power stations employing gas under pressure to transfer heat from the reactor to the steam depends mainly on the efficiency of the heat exchangers. Extension of the surface of the tubes makes them many times more effective.

Although accurate heat transfer data are available, the chief problem, as shown by Dr. R. E. Zoller in a paper given before the North East Coast Institution of Engineers and Shipbuilders, has been to decide which of the many types of fins—flat, tapered, lenticular or elliptical—could be made most cheaply and speedily by the million, using available machinery. Cheaper rolled section, high fin efficiency, high heat transfer, low draught loss or faster welding are advantages held by each stud type in varying degree.

Manufacturing, transportation and erection costs of the complete heat exchanger were stated by the author to have shown an improved stud surface as the best compromise for Hinkley Point station.

INDUCTION GENERATORS

Induction or asynchronous generators, the subject of an I.E.E. paper this week (see page 383), are, of course, induction motors driven above synchronous speed and as such are a very economical method of generation. Apart from their cheapness, they have two other virtues: their output power factor is always leading and close synchronising is not required.

It would thus appear that these machines should be ideal for industrial use, but alone they cannot supply a power system, having to be paralleled with synchronous machines. There are, however, indications that induction generators are being, and will be, more widely used especially at the ends of long transmission lines and in small remote controlled hydro-electric power stations.

AUTOMATIC CIRCUIT RECLOSERS

REVIEW OF SUCCESSFUL OPERATIONAL EXPERIENCE

By R. Mallet, B.A., M.I.E.E.*

IN expressing regret and surprise at the slow progress made to date by most Area Boards on the installation of automatic circuit reclosers, the author must admit to some bias as he has been advocating their use for the past eight years. As units of British manufacture have been available only since the autumn of 1955 it has not hitherto been possible to provide the one answer which should satisfy the doubters, namely, operational experience.

This experience was not available in 1954 when the I.E.E. paper on automatic circuit reclosers was prepared, and only limited experience was available in September, 1956, when an article on the subject was published in *Electrical Review*. In the author's opinion there has now been sufficient experience to show a convincing case for their widespread installation.

The degree of improvement in the standard of continuity of supply, and the savings effected in reduced maintenance costs on any system will depend to a large degree on the amount of lightning trouble, and also to a lesser degree on the nature of the equipment and protective devices already installed. The claims below are based on

TABLE I.—INSTALLATION OF AUTOMATIC RECLOSERS AND SLOW-SPEED FUSES

	At 31.3.1956	At 31.3.1957	At 30.9.1957	Anticipated by 31.3.1958
Number of recloser installations	16	48	63	123
Number of slow-speed fuse installations	73	236	302	—
Miles of 11 kV line protected by reclosers	144	416	494	724
Number of substations protected by reclosers	—	965	1,192	1,900 (est.)
kVA capacity of protected transformers	9,650	31,475	41,755	72,000 (est.)
Miles of 11 kV line not protected by reclosers	1,188	1,121	1,077	900
Number of substations not protected by reclosers	—	—	2,149	—
Number of normal fuse installations	958	957	975	—

experience on an 11 kV overhead system of 1,555 route-miles length, operating in an area where the isokeraunic level varies between 10 and 15. First, the number of interruptions to supply due to faults on the 11 kV overhead system have been reduced to 7 per cent of what they would otherwise have been. Secondly, in addition to eliminating interruptions due to transient faults, the number of persistent faults due to lightning damage has been reduced by nearly 75 per cent and there has also been an appreciable reduction in the persistent faults due to other causes. Thirdly, the automatic reclosers are reliable in operation and need little maintenance. Fourthly, apart from the improved standard of supply provided and the direct and indirect benefits therefrom, the saving in maintenance of supply costs more than covers the interest and depreciation charges on the reclosers.

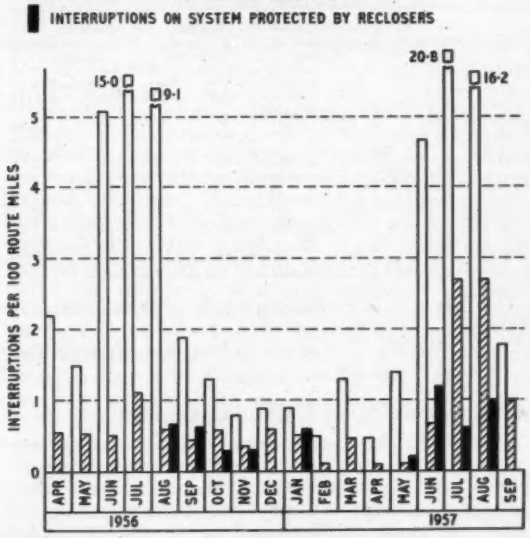
The evidence for these claims is drawn from experience on what is believed to be at present by far the largest installation of automatic reclosers on any system in this country. It will be seen from Table I that by September, 1957, 63 sets of automatic reclosers had been installed, and that a further 60 sets are scheduled for installation before next summer.

The 11 kV overhead system referred to, spreads out over the whole of the Worcester and District Sub-Area, covering an area of 1,150 square miles. Although the greater part of this system has been erected to B.S. 1320 construction, there is a considerable route mileage of line constructed to various other designs. However, these various designs are spread out uniformly over the area as before April, 1948, the whole of the 11 kV system was operated by the former Shropshire, Worcestershire & Staffordshire Electric Power Co. A continuous programme of de-earthing the old design lines has been carried out and by the end of September, 1957, 94·3 per cent of the route mileage of 11 kV overhead lines was not earthed.

The 63 sets of automatic reclosers installed are, from a geographical point of view, distributed fairly uniformly over the whole system and no particular locality has been developed before any other. It therefore seems quite justifiable to assume that that part of the system protected by reclosers has been subject to the same conditions and liability of interruptions of supply as the remainder of the system and to draw appropriate conclusions from their relative performance.

On studying Table I some engineers may consider that the number of normal fuse installations is high. About

Fig. 1.—Monthly interruption figures for the two types of system



* Manager, Worcester and District Sub-Area, Midlands Electricity Board.

85 per cent of the fuses are of the 50 A liquid type, the remainder being rated at 25 A. Individual transformers are fused only where they are situated on main lines, but as a comparatively large proportion of the total route mileage consists of 11 kV overhead main lines, which in addition to performing their normal distribution function, interconnect the 66/11 kV primary substations, a large number of fused transformer installations exist.

Since their installation readings of the recloser counters have been taken monthly, a total of 1,023 operations being recorded during the 18 months to 30th September, 1957. Only one case of incorrect operation of a recloser has occurred, but it is, of course, not claimed that 1,023 interruptions have been saved. For instance, although no damage occurred, a single recloser installation during a severe thunderstorm recorded nine, eight and seven operations on the three respective phase units. This is not an isolated instance, and it would appear that normal slow-speed weight-operated reclosers or repeater fuse installations would be over-taxed under severe lightning conditions and fail to maintain supply.

Fig. 1 shows the interruptions month by month for the two types of system. For the sake of comparison all interruptions on the primary 66 kV system and up to the 11 kV busbars at primary substations have been excluded. The one-second interruption caused by the operation of the automatic recloser units are also not treated as interruptions since they are hardly noticeable to the consumer. Indeed, there has been no indication that consumers have been aware of any of the operations of the reclosers. It will be noted from Fig. 1 that, apart from eliminating the interruptions due to transient faults, the likelihood of persistent faults developing is considerably reduced on the system protected by reclosers.

Some reduction in certain types of persistent faults because of the very rapid cutting off of the fault current was anticipated, but the extent of this reduction which the statistics to date indicate far exceeds the most optimistic forecasts. From the information available it has been possible to calculate month by month the number of transient and persistent faults which might have been expected on a *pro rata* mileage basis on that part of the system protected by reclosers. A summary of these calculations is shown in Table II.

TABLE II.—INTERRUPTIONS ON 11 kV OVERHEAD SYSTEM

Twelve months to 31.3.57	On lines not protected by reclosers		On lines protected by reclosers		Estimate of interruptions avoided	
	Transient	Persistent	Transient	Persistent	Transient	Persistent
Due to lightning ...	308	21	nil	1	89	5
Other causes	97	54	nil	7	27	6
Total	415	75	nil	8	116	11
Six months to 30.9.57						
Due to lightning ...	340	52	3	7	149	16
Other causes	74	25	nil	7	33	4
Total	414	77	nil	14	182	20

The figures indicate that during the 18 months to 30th September at the start of which period there were 16 reclosers installed, and at the end 63, 298 transient and 31 persistent faults were avoided.

Performance Under Lightning Conditions

The benefits of automatic circuit reclosers in improving the continuity of supply are most apparent where severe lightning trouble is experienced. Lightning has always been the main cause of damage and interruptions on the 11 kV system in the Worcester and District Sub-Area where the isokeraunic level of the territory covered is regarded as lying between 10 and 15. However, within the 1,150 square miles of territory covered, thunder was heard on 25 days and lightning caused interruption to supply on 24 days in 1956, the corresponding figures for the summer of 1957 being 28 and 25.

For comparison purposes, certain statistics are quoted in Table III for that part of the 11 kV overhead system not protected by reclosers and for the average of all Area Boards' 11 kV overhead systems, the latter figures being obtained from the E.R.A. Report on Lightning Fault Statistics, published in April, 1956.

TABLE III.—LIGHTNING INTERRUPTIONS ON 11 kV OVERHEAD LINES

	All Area Boards	Worcester & District Sub-Area	
	Average 1951-53	Average 1954-56	Summer 1957
Circuit interruptions per 100 miles	12·8	26·4	31·8
Percentage of persistent interruptions ...	12·4	6·7	13 0

While the number of interruptions during the past summer is shown to be slightly above average so far as the Sub-Area is concerned, the number of persistent faults showed a sharp increase, and is, in fact, nearly three times the national average. In anticipation of possible suggestions that this increase is in any way connected with the installation of reclosers these persistent faults are further analysed in Table IV.

TABLE IV.—PERSISTENT FAULTS DUE TO LIGHTNING, 1st APRIL TO 30th SEPTEMBER, 1957
(Figures for year ending 31.3.57 in parentheses)

Nature of Fault	On lines not protected by reclosers	On lines protected by reclosers
Damage to pole mounted transformers	24 (10)	3 (1)
Conductors burned through and falling to ground ...	9 (nil)	2 (nil)
Damage to bows and jumpers	5 (1)	Nil (nil)
Damage to cable and cable boxes	3 (2)	1 (nil)
Damage to insulators ...	8 (6)	3 (nil)
Damage to other equipment	3 (1)	Nil (nil)
Total	52 (20)	9 (1)

It is considered that the increase in the number of transformers damaged must be largely attributable to an increase in the severity in the thunderstorms, since the number of pole-mounted transformers and miles of unearthed line increased only by some 7 per cent over the previous year. The same reason is put forward in respect of damage to conductors, where on lines not protected by reclosers, high-speed fuses operated in three incidents and in the remaining six incidents which occurred on main lines, o.c.b.s operated. The settings of the protection on all o.c.b.s concerned were in accordance with normal practice and were in no way affected by the need to increase the time delay in tripping in order to back up the auto-reclosers.

In the two cases on lines protected by reclosers where the conductors fell to the ground, the reclosers did not operate, but in the circumstances which prevailed they could scarcely have been expected to do so. In the one case the conductor burned through near an insulator and the live side of the conductor remained supported out of contact with the ground, the section of conductor on the ground being alive through a back feed from a transformer. In the other case the span of conductor which fell to the ground and remained alive was insulated with p.v.c.

Further detailed investigations are being carried out in

respect of both transformer and conductor damage duri. ; the past summer. All the evidence to date, however, does indicate that this damage would have been even more widespread if automatic reclosers had not been installed.

During June, July and August, 1957, in which lightning incidents were concentrated, the number of sets of automatic reclosers installed remained constant at 61 and the route mileage protected by these reclosers also remained substantially constant at 480 miles, so that it is possible to make accurate estimates on a *pro rata* basis of what would have happened had no reclosers been installed. Detailed costs have been kept over the past two years of the labour, material and transport incurred in replacing fuses which had blown due to lightning and also in carrying out repairs. The figures given for expenditure in Table V exclude any allowance for the considerable time spent by engineers both in the field and subsequently in the preparation of detailed reports.

TABLE V.—PERFORMANCE OF RECLOSERS UNDER LIGHTNING CONDITIONS, 1st APRIL to 30th SEPTEMBER, 1957

	System unprotected by reclosers	System protected by reclosers	Estimate of saving
Average miles of line	1,075	480	—
Average number of transformers ...	2,050	1,150	—
Number of transient faults	340	3	149
Number of persistent faults ...	52	9	14
Number of transformers damaged	32	3	15
Number of fuses blown	658	7	288
Expenditure on fuse replacement ...	£4,099	£20	£1,810
Expenditure on transformer repair	£3,136	£170	£1,600
Expenditure on repair to other lightning damage (est.)	£440	£110	£80
Total expenditure	£7,675	£300	£3,490

It will be observed that an estimated saving in total expenditure of nearly £3,500 has been achieved. The cost of replacing fuses may appear to be excessive, although the fuses in general use are of a liquid-filled rewirable type, a very large proportion were damaged beyond repair when operating under lightning fault conditions. This, together with the fact that patrolling of lines is involved, and the major part of the work arises out of ordinary hours at overtime rates, accounts for the heavy expenditure. The figures for the summer of 1957 are not abnormal, as is borne out by the fact that the corresponding expenditure in the summer of 1956 when 622 fuses were blown, amounted to £4,252.

While the actual saving in expenditure in restoring supplies has been shown to be appreciable, the additional advantage of giving a more reliable supply to consumers cannot be stressed too highly. Unfortunately, many consumers in rural areas have come to expect from bitter experience that their supply will be interrupted if a thunderstorm occurs, and they do not, therefore, protest as loudly as might be expected. They do, however, in many instances protect against the effects of failures of supply by not committing themselves entirely to electricity and by employing other alternatives, where possible; thus a considerable revenue is undoubtedly lost throughout the year.

The conditions which exist immediately after a severe thunderstorm are very difficult, as every engineer who has had experience of a rural system knows. It is not, therefore, entirely surprising that in spite of the widespread use of v.h.f. communications between the field engineers and the control centre, the average time taken in restoring the supplies during this past summer in the case of the 340 lightning transient faults, amounted to nearly 7½ hours. Finally, quite apart from the time taken in restoring supplies, the after-effects of a heavy lightning storm are not negligible, and dislocation of the normal work of the engineering staff may continue for many days.

Financial Case for Automatic Reclosers

It has already been shown that with 63 sets of reclosers in commission, a saving of approximately £3,500 per annum could be expected from a reduction of costs of repairs and restoration of supply following damage caused by lightning. A study of the information available would suggest that during a full twelve months a further saving of not less than £1,000 could be obtained as a result of the reduction in the number of interruptions and damage due to other causes, giving a total saving of some £4,500 in a full twelve months.

Capital expenditure to date on the installation of the 63 sets of reclosers, with their associated slow-blowing fuses, amounts to £29,298. Rounding this latter figure off to £30,000, the annual balance sheet therefore becomes,

	£
Depreciation on capital cost of installation at 4 per cent	1,200
Interest at 5 per cent on capital expenditure	1,500
Repairs and maintenance at 2 per cent of capital expenditure	600
Total charge	3,300
Net annual saving	1,200

Over and above this there is the saving in engineers' time and, of course, the indirect financial benefits arising from a higher standard of continuity of supply.

General Experience and Performance

The reclosers are installed with live line taps, as described in the article in the *Electrical Review* dated 28th September, 1956, which enable them to be removed for maintenance without any interruption to supply. So far the maximum number of operations recorded by any single unit has been 32 and no maintenance has been carried out, although certain units have been examined. Apart from a few isolated cases at the beginning of the programme, when incorrect settings were adopted for the o.c.b.s backing up reclosers, there have been no cases of wrong discrimination. All but seven of the 63 sets of reclosers are three-phase units. All the single-phase installations and 29 of the three-phase installations have their operating coils connected for full-load current of 50 A, the remaining sets being connected for full load of 100 A. In two instances 50 A reclosers are connected in lines which are also protected by 100 A reclosers nearer the source of supply. It so happens that in one of these lines a persistent fault occurred which caused the 50 A recloser to lock out correctly after both the 100 A and 50 A reclosers had carried out their appropriate instantaneous operations. In the succeeding month a persistent fault occurred on the line between the 100 A and 50 A reclosers and in this instance the 100 A recloser locked out correctly. The limited experience with reclosers in series has, therefore, so far been completely successful.

Some fears have been expressed that difficulties would be experienced in obtaining the correct operation of reclosers under earth fault conditions, particularly those rated for the normal current of 100 A. The 11 kV system on which these reclosers are installed is solidly earthed and it has been the practice for many years to fuse branch lines with 50 A liquid fuses requiring approximately 100 A to operate, and no difficulties have arisen in obtaining the high fault currents necessary. Fortunately, the conditions for obtaining a low earth resistance are reasonable in the major part of the Sub-Area and a figure of 10 ohms

for the resistance to earth of the metalwork on switch poles, numbering 1,320, and transformer poles, numbering approximately 3,200, is obtained.

During the period of 18 months covered by Table II, three transient faults caused interruptions on lines protected by reclosers. One was due to a newly-installed recloser locking out when no signs of damage could be found, and the other two incidents were due to the blowing of slow-speed fuses during a lightning storm, where again, no permanent damage could be found. Of the 22 interruptions due to persistent faults, all but one were due to reclosers locking out, and in six of these cases the faults appeared to be phase-to-earth only.

More than 1,000 fuse/years' experience has now been obtained with the special slow-blowing 25 and 50 A fuses developed for use with reclosers. During the past 18 months nine fuses have blown in five incidents. On the two occasions referred to in the previous paragraphs, the fuse operated incorrectly, as there was no apparent persistent fault, and on another occasion the fuse, though blowing, failed to clear the persistent fault and the back-up recloser locked out. On the remaining two occasions the slow-blowing fuse actually cleared the persistent faults which were not due to lightning, and the supply was maintained through the automatic recloser.

In the light of this experience and the very small number of persistent faults, the author considers that the expense of installing slow-blowing fuses is not justified. In the comparatively few cases where it is considered justifiable to reduce the number of consumers likely to be affected by the very infrequent persistent faults, additional reclosers can be added in series.

Comparison with Arc Suppression Coils

The author does not dispute the merits of the suppression coil system but this is, of course, essentially an earth-fault protective system, whereas the automatic circuit reclosers are effective for all normal types of faults. Details are not available of the performance of similar 11 kV overhead systems protected by arc suppression coils. The E.R.A. report on lightning faults, already referred to, draws the conclusion that the interruptions caused by lightning are reduced by some 25 per cent as a result of earthing the neutral through an arc suppression coil. The figures in Table II indicate that the corresponding reduction where automatic reclosers are installed is 97·6 per cent, i.e. that the chances of an interruption due to lightning on a system protected by reclosers is about one-thirtieth of that on a similar system protected by an arc suppression coil.

TABLE VI.—ANALYSIS OF HIGH-SPEED FUSE OPERATIONS DUE TO LIGHTNING ON 11 kV OVERHEAD SYSTEM

	Twelve months to 31.3.57	Six months to 30.9.57
Total number of interruptions	335	355
Total number of fuses blown	622	658
Percentage of cases in which 1 fuse blew ...	35·8	36·1
Percentage of cases in which 2 fuses blew	42·6	42·5
Percentage of cases in which 3 fuses blew	21·5	21·4

In the course of investigation into the operation of normal high-speed fuses under lightning conditions, some figures were obtained which give an indication of what might be expected if an arc suppression coil were operating on the system (see Table VI).

The very close similarity between the figures for the two years is quite remarkable and it would seem reasonable to conclude that at least 36 per cent of the interruptions were caused by phase-to-earth faults, and that an arc suppression coil on the system in question might therefore reduce the interruptions by over 36 per cent.

In each year the actual number of interruptions is 54 per cent of the total number of fuses blown and it is suggested that by taking the same percentage of the total number of transient operations recorded on the recloser counters during the lightning season a fairly close estimate of the number of interruptions avoided can be obtained. Making due allowance for lock-out operations and applying this procedure to the counter readings for the six months ended 30th September, 1957, a figure of 254 for transient interruptions saved is obtained, as compared with the figure of 182 in Table II, which was obtained on a *pro rata* basis. The difference between these two figures may well be accounted for by repeated flash-overs under lightning conditions on lines which in other circumstances would have already been "dead."

Conclusions

Experience to date indicates that the likelihood of interruptions to supply arising from faults occurring on lines protected by reclosers is of the order of two per 100 mile-years. Unfortunately, these lines themselves are supplied normally by main 11 kV overhead lines which are not protected by high-speed reclosers and are themselves liable to a greater incidence of interruptions.

On the system under review, it has not been the limitation of 50 MVA on the rupturing capacity of 100 A reclosers which has prevented their use on main lines, rather it is their full-load rating. Further increase of full-load current rating would, of course, in turn require higher fault currents to cause operation and lead to difficulties in obtaining successful operation under phase-to-earth fault conditions. The answer may well be found by developing normal type o.c.b.s with auto-reclose mechanism, together with an operating cycle somewhat similar to that of an automatic recloser, i.e. one or more high-speed trips to clear transient and incipient persistent faults, followed by the normal delayed trip if a persistent fault develops.

Many difficulties have to be faced, particularly with o.c.b.s in series or backing-up automatic circuit reclosers. It is understood, however, that one well-known British switchgear firm is experimenting with an o.c.b. with suitable high-speed operating characteristics. Some of these difficulties would be avoided if, as is suggested previously, slow-speed fuses were eliminated. The automatic circuit-breakers could then either be designed for high-speed operation only, with consequent simplification and reduction in cost, or alternatively the time delay on the slow-speed operation could be considerably reduced.

Further investigation and developments have taken place since this article was prepared, which indicate that the elimination of fuses and of the time delay operations altogether, has many advantages. Furthermore, discrimination of reclosers in series can be maintained by varying the number of reclose operations before lock-out takes place.

In conclusion the author records his thanks to the chairman of the Midlands Electricity Board for permission to publish this article, the views expressed being personal. The author also expresses his gratitude to many colleagues for the encouragement he received, particularly in the early days when the technique of automatic circuit reclosers was new and strange.

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Asynchronous Generators

By P. RICHARDSON, M.I.E.E.*

Summary by the author of a paper entitled "Design and Application of Large Solid-rotor Asynchronous Generators" which was presented to the Supply Section of the Institution of Electrical Engineers in London on 26th February

THE absence of an exciting winding on the rotor of an asynchronous generator creates a leakage field problem around the stator end windings, leading to stator core end heating. The factors affecting core end heating have been investigated.

The power factor of an asynchronous machine is inherently low, and while in certain circumstances this may be turned to advantage, the problem with asynchronous generators in general is to keep the power factor high. The asynchronous generator does not carry an exciting winding and is put on to the bars of a system by running up to speed and switching in without any need for close synchronising as with a synchronous machine. There is, however, an initial current rush similar to that which occurs when switching in a transformer. An advantage of the asynchronous generator is that under fault conditions the fault current decays rapidly and is negligible after the first one or two cycles.

Core End Heating

Stator core end heating is influenced by power factor, excitation, short-circuit ratio and material of the rotor end bell. The end leakage flux has two components, one being the end leakage, on the assumption that the magnetic circuit is energised from the rotor only; this component is related to the gap flux density and is substantially constant. The second component is the end leakage, on the assumption that the magnetic circuit is energised from the stator only; its magnitude depends on the stator current. The resultant field depends on the magnitude and phase of the two components. That this end leakage flux field can cause overheating of the core end sections has been recognised for some time. Where magnetic rotor end bells are used, it is shown that there is a marked increase in loss intensity compared with figures obtained with non-magnetic end bells.

In some parts of the world, where the load is not so concentrated as in this country, an appreciable number of transmission lines are being commissioned to extend the availability of the supply, but the amount of generating plant is not being correspondingly increased. The charging current of the transmission system results in a leading power factor at the generating station, and the difficulties associated with stability are such that consideration has had to be given to the installation of shunt reactors. It would seem that in circumstances such as these it should be possible to make use of the characteristics of the asynchronous generator, which would utilise the capacitance of the overhead line and improve the stability of the units in the generating station. The asynchronous generator would also provide useful power to the system.

In many cases, the high-pressure line of a cross-compound unit runs at the highest possible speed while the low-pressure line is designed to run at a lower speed, thus providing a large exhaust annulus. The asynchronous generator is particularly suitable for use on the high-speed line.

Simpler Construction

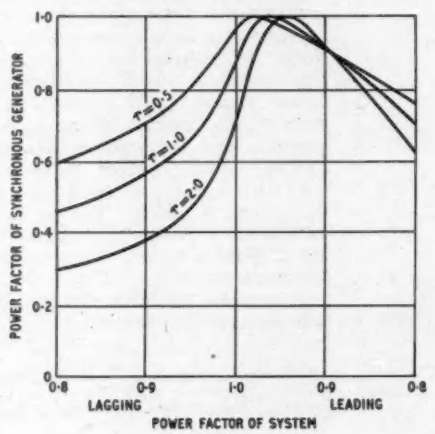
The construction of the high-speed line is more simple and robust than that of the equivalent synchronous generator. The rotor, which would normally have to be of a highly stressed alloy steel, may be replaced by a lower-grade forging, and the use of a highly stressed end bell is avoided. The rotor body end need not suffer the rapid reduction in section normally required to accommodate the rotor end windings, and could be tapered steadily from the body end to give a stiff shaft. The advantages of shaft end stiffness, and consequently high critical speed, are obvious. The absence of an excitation winding obviates the use of slip-rings and the associated problem of current collection at high surface speeds.

The low-speed unit would, in effect, provide the excitation for the asynchronous machine. The additional exciting current leads to a problem of current collection, but the stiffness of the shaft end, the area of slip-ring surface which can be provided and its relatively low surface speed render this problem less difficult.

The real advantage of a cross-compound unit as described above can only be realised when the power factor of generation is greater than about unity or 0·95 leading power factor, as illustrated in Fig. 1, but in certain cases conditions such as this may arise where it is considered desirable to install generating plant close to either fuel or water and transmit the generated power over relatively large distances to the load centres.

* C. A. Parsons & Co., Ltd.

Fig. 1.—Effect of system load power factor on rating of synchronous unit



Electricity Supply in Europe

THE PRESENT POSITION AND FUTURE PROSPECTS

IN November, 1955, the Electricity Committee of the Organisation for European Economic Co-operation (O.E.E.C.) appointed a mission consisting of 20 experts from Austria, Belgium, Denmark, France, Germany, Italy, Sweden, Switzerland and the United Kingdom, together with six representatives from the United States of America, to obtain a general idea of the results achieved with electricity supply in Europe during the last few years, and to enable the progress made in thermal and hydro production and the interconnection of networks to be determined. This mission visited 11 countries and covered nearly 6,000 miles in the course of which 30 hydro-electric and 11 thermal power stations were visited as well as a number of transmission and distribution centres. It has recently issued a report* which is divided into two main sections. The first of these consists of an overall survey in which certain conclusions about the position are reached and the second of more detailed accounts of the conditions in certain individual countries. A considerable amount of statistical data is also given in an appendix. The members of the mission were impressed by the progress that had been made in all countries during the past few years. Technical problems, it was found, had been successfully dealt with and the financial assistance provided by the Marshall Plan had assisted in the modernisation of equipment. Exchange of experience and information had also been developed.

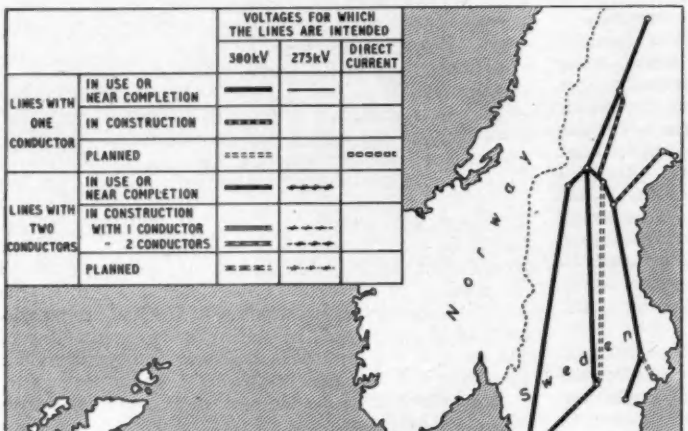


Fig. 1.—Map showing lines in use or projection for voltages of 380 kV and 275 kV

Hydro Production

The proportionate contribution from hydro production would, it was considered, tend to diminish. It would become increasingly necessary to call on large reservoirs to cover peak requirements by making maximum use of their storage capacity. Suitable sites for hydro-electric power stations were becoming increasingly rare, particularly in Western Europe, and the large seasonal reservoirs of the future in the Alpine regions should therefore be planned with a view to their maximum use in an interconnected European network. It would also be worth while to estimate the optimum ratio between the available water power and the installed capacity of a fully interconnected network. Information on the number of hours during which each reservoir power station could operate at full capacity, the volume of water in the reservoir and the volume of supplies from natural sources between 1st October and 1st April would be exceedingly valuable. The increase in exchanges of power between countries should make it possible to husband water resources before the critical water period and to avoid losses in the spring. It was observed that several countries had

* Production, Transmission and Distribution of Electricity in Europe. Paris: The European Productivity Agency of the Organisation for European Economic Co-operation. Price 9s.

built underground power stations, thus increasing the height of the head race. Another advantage of underground stations was that constructional work could be carried out during the winter months.

The general tendency in thermal production was to increase the capacity both of the turbo-alternator groups and the power stations. This led to cheaper plant, but called for interconnected networks of high capacity to ensure regularity in supply. In all countries there was also a tendency towards the use of the unit system as the most economical way of exploiting the advantages of high pressures and temperatures. In certain countries there were long delays in obtaining permission to erect thermal power stations, thus prolonging the building period and making it difficult to take advantage of a rapidly developing technique.

Co-ordination within each country and also internationally was extensive. Apart from large-scale power exchanges between countries there were a number of jointly owned power stations and the mission considered that this form of co-operation could be developed. Long-term forecasts for a more efficient use of hydro resources and thermal sites would be very useful.

Advantages of High Voltages

In the field of transmission and interconnection many countries were studying the advantages of high voltages and the lines already operating, or intended to operate, at voltages above 225 kV are shown on the map (Fig. 1). The standard 380 kV voltage had now been adopted throughout Western Europe. Among various matters of technical interest in this field attention was called to the use of pantograph type circuit-breakers to save space in substations, to the employment of automatic frequency load regulation and to the Pratclaux 220 kV switchgear the constructional cost of which was low. An illustration of this switchgear appears in Fig. 2.

Although the systems of control and operation in each country differed in detail they seemed to work efficiently, interchanges of power between various groups being arranged to achieve the maximum overall economy. There were already many high-voltage interconnections between the Western European countries, but these would have to be strengthened if the best use was to be made of available resources.

Norway was considering the construction of a network to take full advantage of the water power in various parts of the country and of connections with Sweden, Russia and Denmark. Owing to the scarcity of all forms of fuel in Western Europe and the rapid exploitation of the water resources in France, Switzerland, Germany and Italy, it was possible that the reserves available in Norway and Austria (which exported 20 per cent of its hydro production in 1955) might be of assistance in relieving the position until nuclear energy became generally available. It should also be possible to increase the exchanges of electricity derived from hydro and thermal power as was already being done in certain countries.

Some Common Problems

International co-operation would assist in solving such problems as fuel shortage, the recruitment and training of personnel, long-term planning and the use of nuclear energy. In all countries the shortage of mineral fuel was becoming serious so that even with the use of brown and low-grade coal and the full exploitation of hydro resources, it would be necessary to import an increasing amount of coal and oil from outside Europe.

The great increase in demand for engineers and tech-

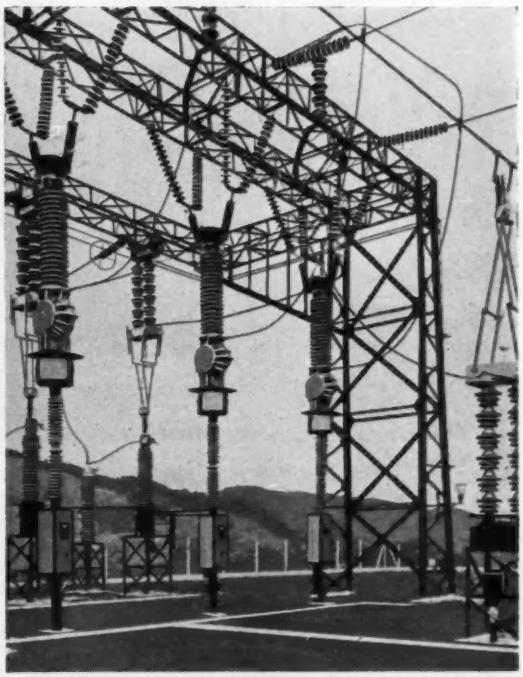
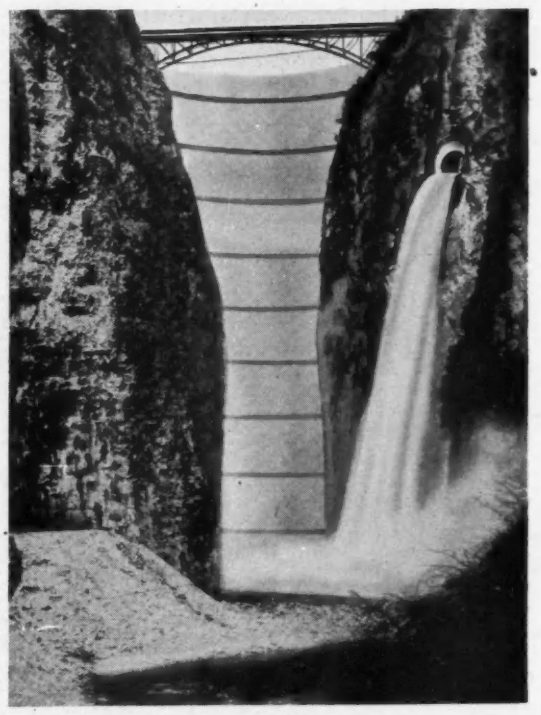


Fig. 2.—Switchgear of low constructional cost at the Pratclaux substation

Fig. 3.—Water power developments in Italy include the Santa Giustina barrage (height 505ft) in the Trentino



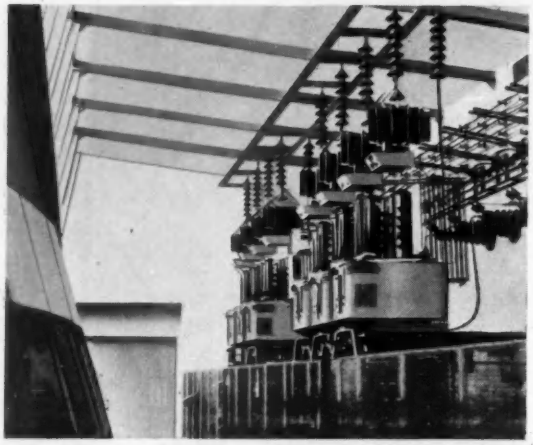


Fig. 4.—Convertor station (Gotland plant)

nicians was making it difficult for the electricity supply industries to secure and retain the necessary help. Many public utilities were, however, offering training facilities to their employees in special centres or laboratories with good results.

In all countries plans were being started for the development of the production and transmission of electric power, including the use of nuclear energy. Information on these programmes was being interchanged through international organisations. It was considered that it would be worth while developing such exchanges and publishing a report showing the estimated load and planned capacity three to four years ahead.

More Co-operation Necessary

The mission felt that, to employ the technical developments that had been made in the joint interest of the countries of Western Europe, action should first be taken at national levels to foster co-operation between the various electricity undertakings. As regards action at international levels, it was necessary to prepare long-term programmes so as to make the fullest possible use of both thermal and hydro resources and to increase power exchanges between countries with interconnected networks, particularly with a view to making the maximum use of available hydro resources at peak periods. The potential benefits of increased international exchanges of information and experience and of co-operation in the development of nuclear energy were especially stressed.

The second part of the report, which may be regarded as the evidence upon which the general survey was based, consists of explanations given to members of the mission by representatives of the electricity supply industry in each of the countries visited. To a considerable extent it inevitably duplicates previous O.E.E.C. publications on the subject which have already been dealt with in the *Electrical Review* and need not therefore be referred to in detail here.

It may be mentioned, however, that under treaty obligations Austria exported 14 per cent of her total power production in 1955; and that until 1960 only 2,650 million kWh will be available from water power in a normal year to satisfy the home demand. After that date it should be possible to meet the expected demands partly by thermal power, possibly from imported coal, or by the use of nuclear power.

The main difficulty in Belgium was the scarcity of coal and its increasing cost. This shortage was encouraging the use of fuel oil, and this in its turn might influence the siting of power stations. A preliminary programme for the use of nuclear energy had been drawn up and 540 MW should be available from this source between 1962 and 1967. In Denmark some of the major power stations in or near the large towns were supplying district heating. Owing to the shortage of national fuel deposits the development of the application of nuclear energy was being watched with interest.

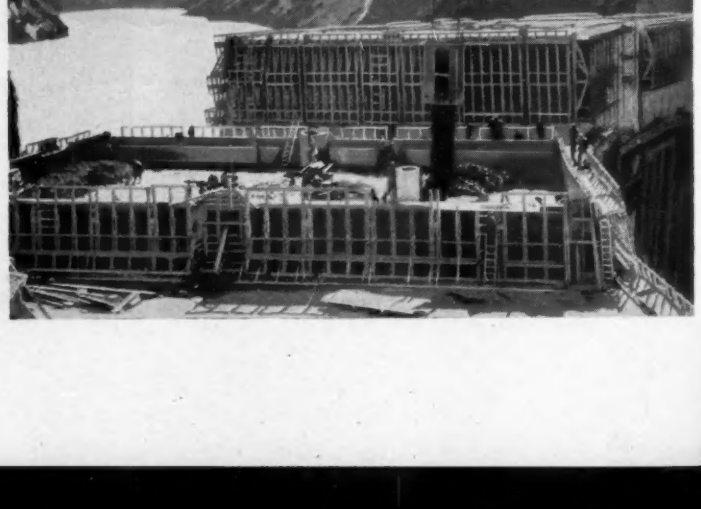
Tidal Power Development

A novel feature of the 1957-61 development programme in France would be the tidal power plant on La Rance estuary to give an annual output of 800 million kWh. Two reactors to be installed at Marcoule, near Avignon, would each produce 25 MW over and above that consumed in the plant itself. A 60 MW unit should be ready for service in an atomic station on the Loire, near Chinon, by the close of 1959 and a second 100 MW unit 18 months later.

In Germany 15 per cent of the total electricity production is obtained from water power, 25 per cent from brown coal and 58 per cent from hard coal, the remaining 2 per cent being imported. The output of the water power stations might fluctuate between 90 per cent and 30 per cent of their capacity, with the lowest output in the winter. Pumped storage plants were used to restore the balance and to cover peaks. Power stations fired with brown coal were used to carry the base load as much as possible. As in future years more coal and oil would have to be imported, the German Federal Republic was vitally interested in the development of nuclear energy for peaceful purposes.

By 1965 the hydro and gas thermal resources of Italy would have been exploited to the limit of 55,000 million

Fig. 5.—Mauvoisin hydro-electric power station



kWh per annum and efforts were consequently being directed to the construction of thermal stations. The development of water power was, however, being continued, an example being the 505ft barrage at Santa Giustina in the Trentino, which is illustrated in Fig. 3. Assuming a load factor of 80 per cent, the capacity installed in nuclear generating stations in 1965 should be about 450 MW.

In the Netherlands 12 million tons of coal was produced annually and seven million tons a year had to be imported. Serious consideration was therefore being given to the use of fuel oil, one million tons of which was produced annually.

Long Spans

An interesting feature of the position in Norway was the existence of a large number of long spans where transmission lines cross fjords. The longest of these was over three miles. Such construction was possible only when there were high mountains on both sides of the fjord. By the end of 1959 about 31 per cent of the annual firm power would have been harnessed, a small part of which might be exported. Unfortunately, the greatest surplus power was in stations on the west coast of Norway from which transmission to other countries would be expensive. D.c. transmission through a cable to Jutland was being studied.

The present programme of development in Sweden aimed at increasing the hydro-electric production by 2,000 million kWh per annum. D.c. transmission had been used since 1954 between the mainland and the island of Gotland with satisfactory results. A view in a convertor station of this scheme is given in Fig. 4. Active interest was also being taken in nuclear energy. The first plant of this type would be completed about 1960 and would have a heat capacity of 75 MW. It would supply the municipal central heating system in one of the large towns in central Sweden.

In Switzerland there had been an increase in average potential output since the end of the second world war. In spite of this the gap between potential and actual output was becoming smaller, the result being that when hydro conditions were below the average during the winter months considerable amounts of power had to be imported from France, Germany and Italy. Native water power resources were, however, still being developed, an example being the Mauvoisin station illustrated in Fig. 5.

SIR JAMES SWINBURNE

TO-DAY is the hundredth birthday of Sir James Swinburne, Bt., the doyen of the electrical industry. Sir James was born at Inverness in 1858; he succeeded to the baronetcy (as ninth to hold the title) in 1934. He was educated at Clifton College and received an engineering training on Tyneside between 1874 and 1881 when he became manager of the Swan Lamp Works in Paris and the United States. About three years later he was appointed manager of the Hammond Lamp Works in London, and then, from 1885 to 1899, was technical manager of Crompton & Co. After this he went into practice as a consulting engineer.

In 1904 Sir James started up a synthetic resin plant to manufacture phenol-formaldehyde condensation products and he may therefore be regarded as the founder of the British plastics industry. Although the venture did not prove very successful, Sir James found that by absorbing the synthetic resin in solvents it made a very good protective coating, particularly as a lacquer for brass fittings. Arising from this discovery, he formed, in 1910, the Damard Lacquer Co., Ltd., and was its chairman from then until the company became part of Bakelite, Ltd. He was appointed chairman of the latter company and held that position until he retired in 1948 when he was made honorary president.

Sir James is a Fellow of the Royal Society, a distinction earned by his research work in the electrical field, and a member of the Institutions of Civil and Electrical Engineers and he is a past-president of the Institution of Electrical Engineers (1902-03) and of the Faraday Society. He is also a past-president of the Old Cromptonians' Association.

For many years Sir James was a regular contributor of papers to learned societies and of articles in technical journals. We are particularly pleased to recall that he wrote for the *Electrical Review* as far back as 1886. This was an article on the Edison lamp filament case in which the Edison-Swan Company had successfully taken action against two other companies to uphold Edison's patent on the carbon filament. Sir James contributed many articles for some years after this.

In the earlier part of this century he was a recognised authority on radio-telegraphy and he served as a member of the technical committees which studied the Imperial wireless scheme in 1912 and 1919.

We extend our heartiest congratulations to Sir James on attaining his centenary and we feel sure that the whole of the electrical industry will join us in wishing him health and happiness.

Sir James Swinburne, who celebrates his hundredth birthday to-day

ELECTRICITY IN SOUTHERN RHODESIA

Commission's Accumulated Deficit now £500,000

FROM A CORRESPONDENT

THE report of the Electricity Supply Commission of Southern Rhodesia for the year ended 30th June, 1957—its twenty-first—is one of considerable interest, particularly to students of electricity supply economics. For the first time since this Commission came into being no steam generating plant is on order in view of the anticipated introduction of power from the Kariba hydro-electric project in 1961.

The overall increase in sales in 1956-57 was 9·9 per cent compared with 7·6 per cent the previous year, but more than 7 million kWh of the increase was due to special sales to Salisbury Municipality. Excluding this, the normal load growth was 8·6 per cent. The average price received per kWh sold was 1·165d (against 1·09d).

Total revenue was just over £3 million (against £2·6 million) and expenditure amounted to £3·3 million (against £2·8 million), resulting in a further loss of £273,000. The total accumulated deficit carried to the balance sheet was nearly £500,000. Capital expenditure now stands at nearly £22 million.

An application for an overall tariff increase of 15 per cent was approved, but the delay attendant upon this application reduced its effect by £73,000.

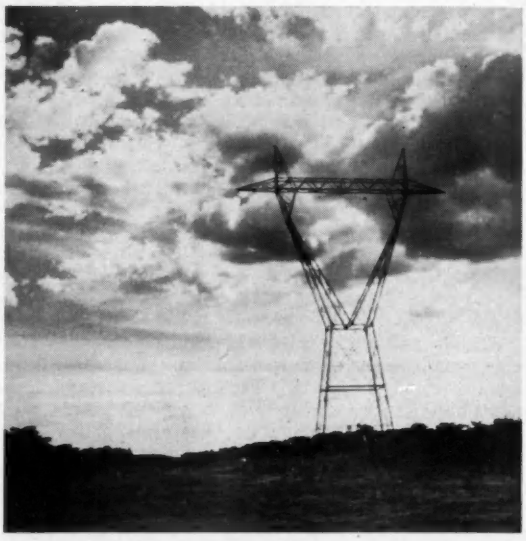
Approval has now been given to the future repayment of loans on an annuity basis (excluding the special loan of £5,500,000 from the International Bank). The opinion is expressed that this method will result in substantial savings in capital charges over the next few years. The conclusion is that repayments of loans will be at a lower rate than at present, which is on a straight line basis over 30 years. No details are given of the life of assets to be used, but since savings are likely it is obvious that much of the assets are to be depreciated over a far longer period than 30 years.

It is difficult to see how any savings can be effected in working costs without extending the life of assets beyond that normally accepted, since the value of buildings and civil works is a comparatively small proportion of the total and a doubling of the life of this plant would only result in a comparatively small saving compared with the accumulated deficit of £498,748.

In a rapidly developing country such as Southern Rhodesia there would appear little harm in such proposals providing future capital expenditure can be kept within the bounds set by increased earning capacity, or if the ultimate cost of power from Kariba can cut operating costs.

Power station results showed a further improvement, but load factors deteriorated, although Umniati, which operates without any pretensions to being a base load station, produced 389 million kWh at an annual load factor of 63·9 per cent.

Mining consumers took 285 million kWh (4·7 per cent increase) and accounted for 46 per cent of the total sales.



Bulldozers are cutting a wide path across the barren bush veld of Southern Rhodesia, from the Zambesi dam site in the Kariba Gorge down to the Federal capital of Salisbury and the Southern Rhodesian midland towns of Gwelo, Que Que and Gatooma. Behind them come the men who are erecting the towers which will in time carry cheap power to the industrial towns, the mining camps and the farms of the Federation

Gold mining consumption still accounts for 53 per cent of the total mining sales.

Municipal bulk supplies improved somewhat and there are indications of development in centres away from the two major cities of Salisbury and Bulawayo.

On the rural electrification side further considerable progress took place, with an overall increase in farming sales of 15 per cent. The average consumption per farm rose to 14,047 kWh per annum, which must be one of the highest in the world.

Of interest to distribution engineers are a series of graphs showing the progressive improvements that have taken place in system operation, particularly the reduction in the faults per 100 consumers and per 100 miles of line. Between the years 1940-41 and 1956-57 the supply interruptions per 100 consumers per annum dropped from 130 to 28. This, it must be remembered, is in a country which experiences some of the worst thunderstorms in the world and on a system where there are more miles of line than there are consumers.

Stereophonic Recording

AT an informal evening meeting of the Radio and Telecommunication Section of the Institution of Electrical Engineers on 24th February, Mr. H. A. M. Clark gave a talk on stereophonic recording on gramophone discs. While tape was technically superior, he said, discs were at present cheaper and more easily handled. During the past five years recording instruments had been designed for cutting a complex track to present-day micro-groove standards. Lateral and vertical directions for two channels had been developed by some companies in Great Britain, Germany and Denmark, while two directions, each at 45 deg to the surface of the wax, had been favoured by other companies in Great Britain and the United States. It was essential that what constituted the best system should be agreed by all recording companies so that standards could be issued to enable manufacturers of reproducers to design equipment suitable for all makes of records.

VIEWS on the NEWS

By REFLECTOR

NATURE seems to be backing up the organisers of the International Geophysical Year with magnetic storms of unwonted intensity. The General Post Office reports unusual happenings at telephone exchanges as far south as Tunbridge Wells, Hastings and Folkestone recently when the Aurora Borealis was visible in that area. There was frequent flashing of calling lights which was not due to callers. P.O. engineers investigated and came to the conclusion that the phenomena were caused by voltages induced on certain types of long-distance circuits. These voltages were sufficient to operate relays and light up some thousands of lamps on switchboards. It is said that similar effects were observed in other parts of the country. In the Carlisle district induction was observed to occur mainly on the overhead lines. Transmission seems to have remained unimpaired, and the Post Office notes that the transatlantic telephone cable, because of its special construction, remained in service although subjected to high induced voltages.

* * *

I must, of course, not prejudge the result of the recent inquiry into the Central Electricity Generating Board's application for permission to build a nuclear power station at Trawsfynydd, North Wales. It does seem, however, that the weight of the evidence was in favour of the scheme because it would provide employment in an area which badly needs it. Opposition came from bodies concerned with the natural beauty of the territory—or what they claim to be natural beauty. One representative appeared to be badly briefed and was shown to have based some of his contentions on second-hand unreliable data. On the other hand, Dr. Mervyn Haigh, the former Bishop of Winchester, said that the Council for the Preservation of Rural Wales, which he represented, was not opposed to the station. He regretted the necessity for it, but realised that the station was really wanted; he went so far as to say:—

> "What interested us as a Council was the really astonishing suitability of this site for the building of a power station."

I hope that Dr. Haigh will think, when the station is completed, that it does not injure the amenities of the district. Great care is being devoted to the design of these stations.

* * *

"America's Independent Electric Light and Power Companies" ask in an advertisement in the *Atlantic Monthly* "How many ways do you put electricity to work?" To enable readers to give a complete answer the advertisement contains a full list of the available appliances, each item being illustrated by a little sketch. Sixty applications are listed, with one extra labelled "Other." Some of the equipment included is practically unknown here; I may instance the automatic saucepan, the bottle warmer, the ozone lamp, the garage door opener and the knife sharpener. The companies say that if the reader can score 45 items or more his standard of living is excellent; 30 to 44 is very good, 15 to 29 good, but "with less than 15 you're missing a lot." I should say that very few homes here would be "excellent" under this classification—or even "very good"—but there is no doubt that we are improving.

* * *

Southern Electricity says that in issuing "Interruption of Supply" notices the Engineering Department of the Southern Electricity Board always addresses the card to "The Occupier." Following this rule, a card was recently sent by the Department to "The Occupier, Parkhurst Prison, I. of W." This is an instance in which an interruption of supply might be welcomed by some of the occupiers.

* * *

Reference was made in "Road Research 1956" (Department of Scientific and Industrial Research) to experiments which were being carried out in the electric heating of roads to prevent ice formation in wintry weather. It had been found that from 1 to 6 W/sq ft was sufficient for the purpose. We must await the 1957 report for further news of these experiments, but in the meantime *The Times* reports that a stretch of *Autobahn* in Western Germany heated by electrical means is now in actual use. It is said that the system is to be extended first to mountain passes, steep hills and *Autobahn* bridges and that airport runways may be similarly equipped.

* * *

Poor salaries were being paid in the electricity supply industry sixty years ago and the *Electrical Review* published many letters from disgruntled power station men. For instance, in the issue of 25th February, 1898, "Disgusted" wrote as follows:—

> "I notice in your issue of February 18th, an advertisement for a shift engineer, at the princely salary of £50 a year. It certainly appears to me that the unfortunate shift engineer of the future will not only be held responsible for the working of £10,000 worth of machinery for eight hours every day, but will also be expected to 'tip the chief engineer' for being allowed to do it. No doubt Mr. Boot is very proud of that passage in his report which runs: 'Tunbridge Wells is the only station working on the high tension system which has not made a call upon the ratepayers in the first completed year's working.' It seems probable to me that the staff were called upon instead of the ratepayers. Possibly the air of Tunbridge Wells is so invigorating that shift engineers require no dinner; or, perhaps, as it is near springtime, the happy successful candidate will lightly turn his thoughts to love—and live on that. Is it not time that, in these days of successful stations, junior electrical engineers should receive a fair day's pay for a fair day's work? Mr. Boot is evidently more successful in drawing up high-sounding reports than in learning what constitutes a 'living wage.' My hearty sympathies are with the successful candidate."

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

The Institution and Its Members

I READ with much interest the letter from Mr. H. W. S. Marshall, A.M.I.E.E., which appeared in your issue dated 31st January, and was particularly struck by his two concluding paragraphs, since what he there says is well realised by the Council of the Institution, who, for some years past, have urged the preparation and contribution of short papers with a practical slant designed to interest the engineer operator, and particularly those whose duties are carried out overseas.

As an earnest of this I would direct the attention of any of our members who may be interested to the foreword headed "Short Papers and Correspondence" which appeared in the *Journal* of the Institution for October, 1954, and an announcement which appeared in the *Journal* in September, 1957, on page 528, headed "Practical Papers in the Proceedings."

Because of his interest, and as he may not have the two issues handy, I am sending copies of them, and of this letter, direct to Mr. Marshall in Iraq.

London, W.C.2. W. K. BRASHER,
Secretary,
The Institution of Electrical Engineers.

"What Every Dealer Should Know"

MR. BANNER'S article in your issue of 14th February fulfils the proverbial long-felt want by drawing attention to the slipshod nomenclature adopted by dealers who should know better. However, even manufacturers add to the confusion. For example, the current catalogue of an international organisation says, when describing possible applications of small neon lamps:—"The lamp is connected parallel to the contacts of the wall sockets and will light when the wall plug is live."

Those people who refer to socket-outlets as wall-plugs and plugs as plug-tops must be in difficulties when they wish to speak of the particular part of a plug which covers the terminals. Do they call it a wall-plug plug-top top?

Mr. Banner's last sentence is not strictly correct in that Amendment No. 1 to B.S. 1362 : 1953, dated 24th May, 1956, deleted the fuse ratings of 3 and 7 A and added 2, 5 and 10 A.

Stretford, Manchester. A. R. ASTBURY.

"Apprenticeship Conflict"

I HAVE read with interest the jaundiced comments made in your editorial on "Apprenticeship Conflict" contained in the 14th February issue of *Electrical Review*.

You appear to adopt the attitude that any criticism of the employers in the electrical contracting industry, no matter how valid, is in your words "vilification of the employers." The references in the January issue of *Electron* were, in fact, couched in very moderate language, and you would have performed a better service if you could have answered the Union's criticism rather than make undignified statements about "vilification."

In the only criticism you make you appear to betray an abysmal ignorance of the 1950 National Apprenticeship Scheme. You quote the Union as saying that in the seven years of the Scheme's operation 13,703 apprentices were registered and 2,886 completion certificates were issued. You then make the point that 20 per cent of the apprentices received completion certificates, a fact which would seem to support the N.F.E.A.'s argument. I would have thought that even you would have known that completion certificates are only issued at the end of a five years' apprenticeship, so your 20 per cent has no relevance whatsoever.

Without publishing private and confidential figures, let me give you the record: In 1951 there were 1,895 apprentices registered. In 1956 1,063 apprentices received completion certificates. By all laws and figures it does appear that a very high percentage of lads registered do complete their apprenticeship.

Perhaps you will be good enough to publish this comment.

Hayes, Kent. R. G. MCLENNAN,
Assistant General Secretary,
Electrical Trades Union.

"What Price Co-ordination?"

IT seems pointless to reply to Mr. Gamlen's letter appearing in your issue of 7th February when he has been unfortunate in his "timing" and now may wish, after all his protestation, to review his thoughts in view of the Minister of Power's decision to appoint a committee to do part of what I requested. I mean "part" because although the decision is good, it is not good enough. The major issue—a comprehensive fuel and power policy—is not being tackled meantime it would appear. This is unfortunate.

Scientific development and research results are truly exciting these days, and not exclusively confined to the electrical field of activity. So, political energy should be adventurous too and the Minister might, with great benefit ultimately to the nation, favour my original comprehensive suggestion, provide for the major and minor aspects at one time, and extend the terms of reference to his new committee.

I was aware of the Ridley Report, and am not perturbed by the fact that the Minister feels it may be necessary to have another look—time changes circumstances.

I hope Mr. Gamlen may let his imagination exercise and help the means to an end whereby "public service" wherever rendered, civil service, nationalised industry or local government, will be recognised on a uniform basis with all the benefits that can accrue. What could these be? Just imagine! Mr. Gamlen's last paragraph—"increased price of coal has bedevilled our costs"—surely suggests that a national fuel policy is needed.

Glasgow. WM. B. M'ARTHUR.

Mine Battery Charging

THE "Charging and Changing of Locomotive Batteries Underground" is the subject of the National Coal Board's information bulletin No. 57/191. The main problem connected with the use of the battery locomotive is to keep it supplied with charged batteries with the least time loss and the least expense. Both batteries and locomotives should be designed with this in mind.

PARLIAMENTARY REPORT

The Trawsfynydd Scheme

In reply to a question by Mr. Gerald Nabarro about the proposal to erect a nuclear power station at Trawsfynydd, in the Snowdonia National Park, Sir Ian Horobin, Parliamentary Secretary, Ministry of Power, said that the Minister, Lord Mills, had received an application under Section 2 of the Electric Lighting Act, 1909, as amended, for consent to the construction of a nuclear power station of 400-500 MW which would be linked with the pumped storage scheme under construction at Blaenau Ffestiniog. There were no further proposals for pumped storage schemes in North Wales. (Mr. Nabarro had suggested that there were to be further schemes.)

Mr. Nabarro also asked if a scale model of the station and the pumped storage works could be displayed in the Palace of Westminster in view of the overriding considerations of amenity and access in areas designated as National Parks.

Sir Ian Horobin said it was not possible at this stage for the Generating Board to make a scale model of the station that would be built if the Minister's consent was secured. The actual design and layout would not be determined until the Board had awarded the contract and had consulted a number of expert bodies and advisers, including the Board's consulting architect for Wales, a landscape consultant, the County Council and the Royal Fine Art Commission.

Import Duties Bill

When the Import Duties Bill was considered on second reading in the House of Lords, Lord Shepherd asked the Government to investigate the way in which drawback facilities were being abused. He said that many kinds of goods which would eventually be re-exported came into Britain. Duty was paid, but it was refunded when the goods were re-exported. We had a trade agreement with Japan for importing goods amounting to £30 million. It had come to his notice that some Continental firms were shipping goods into this country against orders that they had received from Japan. There was no licence and no currency available for those firms in their own countries, but what they did was to send the goods into Britain with no country of origin stamped on them. The goods were then being re-exported from Britain by traders using British invoices and using the allocation of sterling which was for goods manufactured in this country.

Lord Swinton said the Government should state clearly that it was completely illegal under the drawback law for a merchant to export from here goods which had been put into cold storage or bond from a foreign country in order to fulfil a British quota.

Lord Mancroft, Lord in Waiting, said that as he understood the law, Lord Swinton was correct, but he would like to go into the matter more carefully. It was important not only with regard to Japan but other countries as well.

Closing of Naval Establishments

In an announcement about the closing down of some Naval establishments, Mr. T. G. D. Galbraith, Civil Lord of the Admiralty, said that the Sheerness and Portland dockyards were to be closed by 1960; at Chatham the dockyard would be retained but the barracks and other Naval establishments would be closed by April, 1961. The Aircraft Repair Yard at Donibristle would be closed by the end of 1959 and the stations at Ford, Bramcote and Eglinton would be closed in about a year's time. The air station at Brawdy and the Air Electrical School at Worthy Down would close later.

Employment at Dounreay

Sir David Robertson asked the Prime Minister why local men of good character who had worked for several years on the construction of the fast breeder reactor at Dounreay were being discharged as redundant when men from distant places (where work was more readily available) were retained with subsistence allowances plus regular overtime.

Mr. Macmillan said that the Atomic Energy Authority's contractors were discharging staff because the construction programme was nearing completion. Local men were discharged only when there was no longer suitable work for them. Whenever possible, alternative work on the operational side of the establishment was offered to them.

Financing Nationalised Industries

The Nationalised Industries Bill, which extends from 31st March to 31st August, 1958, the limit of time within which advances may be made under the Finance Act, 1956, out of the Consolidated Fund to the nationalised industries, other than the National Coal Board, was read a first time in the House of Commons. It was stated in a financial memorandum to the Bill that it was estimated that of the £700 million which the 1956 Act authorised to be advanced to these industries, £580 million would have been advanced by 31st March and the remaining £120 million would be advanced between 1st April and 31st August.

Mr. Maudling, Paymaster General, stated on 5th February that the Bill would give the Government time to consider the present method of financing the nationalised industries in the light of the Government's general financial policies and to include any necessary provision in the Finance Bill embodying the Budget proposals this year.

Many Conservative back-bench members are pressing the Government to end the system under which money is raised under the cover of a Treasury guarantee, and to provide that the industries should go to the market like private industries to raise their capital. From Government circles they have not received, so far, any indication that their suggestions will be adopted.

Marchwood Dispute

In answer to Mr. Charles Hobson, the Minister fo Labour (Mr. Iain Macleod) said that 17 electricians and seven electricians' mates employed at Marchwood power station by the Contracting Section of the London Electricity Board ceased work on 10th January in support of a demand that they should be given certain work which was being done by members of another union. The dispute had not been reported to him by any of the parties involved and appeared to be one which should be settled by the unions concerned.

Mr. Hobson said that the dispute, which had been on for six weeks, was a demarcation dispute arising as a result of the work of the London Electricity Board Contracting Section being given to the Maybridge Engineering Co., in which, as had already been admitted in the Press, the heads of the London Electricity Board Contracting Section had interests. In view of the special circumstances, would the Minister intervene? Or was this one of the cases when there was no room to manœuvre?

Mr. Macleod replied that the information he had was that there was no connection between this dispute and the question which arose as to the giving of contracts for part of this work to the Maybridge Construction Co. If the Ministry could help in this dispute of course they would.

Radio and Television Licences

The Assistant Postmaster General (Mr. Thompson) informed Mr. Hunter that the amounts received by the Post Office in 1957 for sound radio licences and combined sound and television licences were £6,841,988 and £23,341,332, respectively, the latter figure excluding excise duty. The numbers of licences issued were 6,904,096 and 7,782,042.

Science in Universities

An expansion of the university building programme to secure more science and technological graduates was announced by the Chancellor of the Exchequer, Mr. Heathcoat Amory, in the House of Commons last week.

He said that after considering the

recommendations made by the University Grants Committee, he had given authority for a programme to be prepared on the basis that university building projects would be started up to a value of £15 million in each of the four years 1960-63. This programme must be of a provisional nature, and subject to review if the economic situation changed substantially.

Mr. Paul Williams hoped that this development would in no way militate against the technical colleges which were now vitally important. Would those colleges also be able to advance at a greater rate?

Mr. Amory said that the programme for the technical and technological colleges was receiving the highest possible priority. They had a very important part to play in expanding the number of scientists and engineers.

Replying to Mr. Peart, Mr. Amory said that at present about 43 per cent of university students were arts students, but it was expected that about two-thirds of the expansion would relate to science and technology.

Overseas Trade Fairs

Mr. Sydney Irving asked the President of the Board of Trade if he had received the report of the Exhibitions Advisory Committee on their review of the present practice and policy on overseas trade fairs and what changes he proposed to make.

Sir David Eccles gave a summary of the Committe's report and its conclusions. He said he had accepted them in principle and proposed to act on them, within the limits of the money available. The principal conclusions were as follows:—The Board of Trade should continue to provide information about trade fairs. In overseas fairs where official Government stands were installed it was not sufficient to provide mere inquiry desks—stands with display were essential. Such displays should normally be concentrated on a single industry or group of industries, and approaches should be made to trade associations in some of the capital goods industries for their co-operation in organising them. The number of these stands in any year should be limited and the fairs chosen for them should vary from year to year; the main cost of the stands must be borne by the Board of Trade, but firms or industries whose goods were shown on them should be expected to lend exhibits free of charge and normally to pay for transport and for expert staff where their attendance was necessary.

If the results of joint participation of industry and Government in specialised fairs were found to be successful, this joint participation should be increased.

In fairs organised on the basis of national pavilions the United Kingdom would be outclassed and British manufacturers might be virtually deprived of the opportunity of showing their goods unless a contribution was made from public funds to the cost of organising a pavilion. Where such pavilions were necessary the responsibility for constructing and managing them should normally rest with the Board of Trade, but there might be occasions when the management of pavilions could conveniently be entrusted to a commercial concern for a fee.

The United Kingdom was not spending as much as its main competitors on official participation in overseas fairs. Expenditure on United Kingdom official participation in such fairs should be reviewed now and should remain under constant review, consideration being given to any upward adjustment necessary in respect of 1958-59 and later years.

Smoke Control Orders

In reporting on the progress which has been made in carrying the Clean Air Act into force, Mr. Bevins, Parliamentary Secretary, Ministry of Housing and Local Government, informed the Commons on 19th February that the Minister had confirmed 10 orders for smoke control areas covering 1,000 acres and 7,500 buildings. Three orders under local Acts had been confirmed. That was a modest start. Another 16 orders involving about 1,200 acres were before the Minister for his consideration, and another 51 proposals covering 61,000 buildings had been provisionally notified to him. Under tenancy conditions 15,000 houses on local authority estates were to be made smokeless.

Mr. Bevins, replying to questions, said the Government decided to make 1st June the second appointed day under the Act, and to make the Order for it several months in advance because they believed it was only right to give those who would have to apply its provisions appropriate notice.

There was an Alkali Works Order, dealing with the iron, steel and metallurgical industries, which the Minister expected would come into force on 1st June, but that would be laid under the Public Health Act, otherwise the processes would remain under the provisions of the Clean Air Act.

Consideration was being given to the desirability of making regulations relating to the installation in factories of apparatus to check the density of smoke.

Diploma in Technology Courses

Mr. Albu asked the Minister of Education to state the number of students in the first and second years, respectively, of courses for the Diploma in Technology.

Mr. Geoffrey Lloyd gave the answer in a table. This showed that there were one full-time and seven sandwich courses in electrical engineering, first year students numbering 235, second year 151, third year 72, and fourth year 40, a total of 498.

Road Lighting Powers

In the House of Lords Lord Derwent asked the Government whether the Minister of Transport could, by an Order made under Section 3 (1) (e) of the Special Roads Act, 1949, assume the powers of exclusive lighting authority in respect of a road for which a scheme had been made under that Act.

Lord Mancroft said that this was possible.

Repair Charges

Mr. Janner asked the President of the Board of Trade whether his attention had been called to the excessive increases which had been made recently in the cost of repairing various types of domestic equipment. Mr. Gibson put a similar question regarding the prices charged for the repair of radio, television and other electrical apparatus. About seven million households had television sets, he said, and people were quite ignorant about what repairs were necessary when anything went wrong.

Sir David Eccles said the size of the market mentioned by Mr. Janner showed what a lot of competition there must be. Neither he nor the Minister of Supply had any power to control repair charges and he did not see how they could do it.

Resale Price of Electricity

Mr. Palmer asked the Paymaster General if he would consult the Electricity Council as a preliminary to giving a general direction on the carrying out by the Electricity Boards of Section 29 of the Electricity Act, 1957, which requires the fixing of maximum charges by the Boards for the resale of electricity to sub-tenants and other persons.

Mr. Maudling replied that the Minister of Power considered that this power, which was permissive, could best be exercised by the Boards themselves in the light of local circumstances.

Mr. Palmer said that this was a matter of great importance and interest to the consumers. Was it not desirable that there should be a national policy, to be followed by all the Boards generally?

Mr. Maudling said he understood that the Boards were in fact considering the matter in the light of local circumstances and in consultation with the Electricity Council, who had referred the question to the Retail Tariffs Committee.

Dalmuir Factory for Babcock & Wilcox

In answer to Mr. Bence, Mr. W. J. Taylor, Parliamentary Secretary, Ministry of Supply, said agreement had been reached for the transfer of the Royal Ordnance Factory at Dalmuir to Babcock & Wilcox on 1st January, 1959. In the light of discussions that were in progress, he had every hope that the company would need a high proportion of the labour force, as well as much of the machinery. There were now about 430 skilled workers at the factory.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The B.B.C. announces the appointment of **Mr. W. R. Fletcher,** B.Sc. (Eng.), A.M.I.E.E., as regional engineer, North Region, in succession to **Mr. B. H. Vernon,** Assoc. M.I.R.E., who has retired owing to ill-health after nearly thirty-five years' service with the Corporation.

Mr. Fletcher joined the Engineering Division of the B.B.C. in 1936. In 1940, after serving at the Lisnagarvey and Burghead transmitting stations, he was appointed engineer-in-charge of a temporary wartime transmitter, and in 1944 he became senior maintenance engineer at the overseas short-wave broadcasting station at Rampisham, Devon. In 1949 he was seconded from the B.B.C. to serve as chief engineer of Radio Ceylon, and in 1957 he was appointed resident engineer at the British Far Eastern broadcasting station near Singapore. Mr. Fletcher returned from his overseas secondment in 1955 to become engineer-in-charge at the B.B.C. high-power medium-wave transmitting station at Brookmans Park, and in 1957 he became a senior establishment assistant in the Engineering Establishment Department. He will be taking up his new duties in the summer, and until he takes over, **Mr. E. L. Lycett,** M.B.E., the assistant superintendent engineer, sound broadcasting, outside broadcasts, will be acting regional engineer, North Region.

Mr. Vernon joined the B.B.C. in 1923 on the maintenance staff of the first Manchester transmitter, 2ZY. At the outbreak of the war he was appointed engineer-in-charge, Manchester, and since that time he has been closely associated with the expansion of both sound and television broadcasting in the North of England.

The Incorporated Advertising Managers' Association has conferred a Fellowship on **Mr. Allan H. Edney,** M.A.A., F.I.A.M.A., group advertising manager, Parnall (Yate), Ltd., in recognition of his services to advertising generally, and advertising management in particular. Mr. Edney is serving his second year of office as chairman of the Society of Members of the Advertising Association (M.A.A.). He also serves on the Council and Executive Committee of the Advertising Association, is a Council member and education officer of the Publicity Club of London, and a member of the Export Advertising Committee of the Incorporated Society of British Advertisers, Ltd., for which organisation he is also his company's representative.

Mr. A. H. Edney

The following changes in Association representation on the Electrical Fair Trading Council are announced:—Accumulator Makers' Association: **Mr. D. Eccles** (Chloride Batteries, Ltd., and chairman of the A.M.A.) and **Mr. H. Kirkwood** (secretary of the A.M.A.), in place of **Mr. C. H. Branton** and **Mr. F. Topping.** Associated Manufacturers of Domestic Electrical Appliances: **Mr. B. MacFadden** (Bulpitt & Sons, Ltd.) and **Mr. A. M. Parkinson** (English Electric Co., Ltd., and chairman of A.M.D.E.A.), in place of **Mr. C. R. Duncombe** and **Mr. J. S. Warren.** Association of Manufacturers of Electric Wiring Accessories: **Mr. J. A. C. Kendle** (Siemens Edison Swan, Ltd., and chairman of A.M.E.W.A.), in place of **Mr. P. E. Wheatland.** Association of Manufacturers of Small Switch and Fuse Gear: **Mr. R. H. Scholes** (G. H. Scholes & Co., Ltd., and vice-chairman of A.M.S.S.F.G.), in place of **Mr. R. Nicholls.**

Mr. J. J. Jordan, at present branch manager of Philips Electrical, Ltd., Cardiff, has been appointed regional manager, north-west region, with effect from 17th March. **Mr. N. D. Margerison,** at present regional manager of the company's north-west region, becomes commercial manager of the gramophone records division with effect from 17th March.

Mr. J. McAlister, B.Sc., A.M.I.E.E., has been appointed manager of the Sevenoaks and Reigate District of the South Eastern Electricity Board in succession to **Mr. H. F. Gill,** who retired on 25th February.

Mr. McAlister, who is at present deputy manager of the Board's Croydon and Purley District, was educated at Ballyclare High School and the Royal Belfast Academical Institution before taking his degree at Queen's University, Belfast. Following apprenticeship with A. Reyrolle & Co., Ltd., he served with the Electricity Board for Northern Ireland successively as junior engineer and district engineer until 1937 when he joined the Southern Areas Electric Corporation. In 1948 he was appointed by Seeboard as Purley manager and became deputy manager of Croydon and Purley when these two districts were amalgamated in December, 1956. He is vice-chairman of Crawley Secondary and Grammar Schools Board of Governors.

Mr. Gill has been associated with electricity supply since 1909 and was area manager for the former County of London Electricity Supply Co. before becoming district manager for Seeboard. Born in Croydon and educated at Christ's Hospital, he joined the County Company in 1909 as a junior clerk and worked in the secretary's department until the outbreak of the 1914-18 war. After service in the Royal Engineers (he was awarded the M.M. and M.C.), Mr. Gill had seven years as private secretary to Sir Harry Renwick, chairman and managing director of the County group of companies, and subsequently served successively as commercial officer, trading superintendent and area manager. With Seeboard he has been Sevenoaks and Horley manager and later Sevenoaks and Reigate manager. Mr. Gill is secretary of the Surrey Branch of the E.I.B.A. and chairman of the South Eastern Branch of the Association of Managerial Electrical Executives.

Mr. J. McAlister

Mr. H. F. Gill

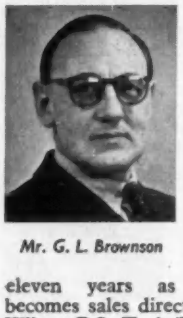
The South of Scotland Electricity Board announces that **Mr. A. C. Carse,** F.A.C.C.A., has been appointed accountant of the Lanarkshire Area at Hamilton. Mr. Carse has been accountant of the Ayrshire Area of the Board since 1953. Previously he was accountant of the Dumfries and Galloway Sub-Area, which appointment he took up in 1948 on the nationalisation of the electricity supply industry.

The President of the Board of Trade has appointed **Mr. Gordon Grant,** C.B., an Under Secretary of the Board, to be Comptroller-General of Patents, Designs and Trade Marks with effect from 3rd March. Mr. Grant succeeds **Mr. J. L. Girling,** who has been Comptroller-General since 1954.

On Friday last the **Incorporated Plant Engineers** held their sixth annual dinner at the Connaught Rooms, London. A toast to the institution was proposed by Sir Cuthbert Clegg. He congratulated them on their twelve years of successful existence. He also referred to the Clean Air Bill and praised the work which the institution was doing in this connection. The

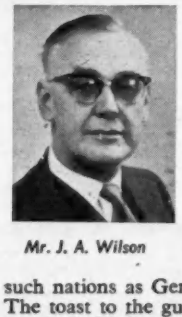
response was made by Mr. Vincent Taylor, president. He discussed the functions of the plant engineer and made reference to some of the difficulties with which he had to contend. A toast to the guests was proposed by Mr. J. Wilson, Major-General Cyril Lloyd responding.

Small Electric Motors, Ltd., Beckenham, have made the following appointments:—**Mr. G. L. Brownson,** B.Sc.Tech., M.I.E.E., who has been works manager for eighteen years, has been appointed technical director and chief engineer; **Mr. K. H. Harding,** who has been with the company for eleven years as sales manager, becomes sales director; and **Mr. J. A. Wilson,** B.Sc.Tech.(Hons.), A.M.I.E.E., who has been assistant works manager for the last seventeen years, has been appointed works manager.



Mr. G. L. Brownson

Mr. K. H. Harding



Mr. J. A. Wilson

Some 160 members, with guests from all parts of the Midlands and the North West, attended the annual dinner of the North Staffordshire Sub-Centre of the **Institution of Electrical Engineers** held at Stone on Friday last week. The guests included Mr. T. E. Goldup, President of the Institution, Sir George Barnes, principal of the University College of North Staffordshire, and Alderman A. G. B. Owen, chairman of the Staffordshire County Council.

Proposing a toast to the Institution, Sir George spoke of the need for more technologists. The grave shortage in the world at the present time was not bread but brains. The only way we could make use of those brains was to train them in the right way and that was their business at the college.

Responding to the toast, Mr. Goldup said we had a distinct advantage in this country in having produced ZETA and he thought we had cause to be quite satisfied with what had gone on so far in the implementation of these advances of scientific knowledge and thought. Electrical engineers, he said, had the task of seeing that the benefits of the original research carried out in this country were ultimately used for the benefit of humanity as a whole. One thing likely to upset this progress, however, was the increasing difficulty of the problem of the number of technicians and professional men who should be available to do all the things we wanted them to do. He urged those present to do their part with the young men who were coming along and who had to take their places in industry, in the institutions and in teaching, to look upon this problem of the provision of men as one of extreme importance. Only then should we be able to compete successfully with such nations as Germany and Russia. The toast to the guests was proposed by Mr. R. W. Palmer, vice-chairman of the Sub-Centre and principal of the Post Office Engineering Department Central Training School, the response coming from Ald. Owen. Mr. H. A. P. Caddell, chairman, presided.

In our last issue we inadvertently inserted biographical notes of **Mr. G. T. Shepherd,** B.Sc. (Eng.), A.M.I.Mech.E., A.M.I.E.E., A.C.T. (Birm.), who has written an article for us on "Some Factors Affecting the Operation of Nuclear Power Stations," in which we stated that the article appeared in that issue. Mr. Shepherd's article will, in fact, be published in our issue of 14th March.

The **Worshipful Company of Tin Plate Workers alias Wire Workers of the City of London** announces that the first place in the essay competition among those awarded travelling scholarships, 1957, has been gained by David Alan Kidd, employed by the Central Electricity Generating Board at Sculcoates power station, Hull. Second place goes to David Alan Kendall, employed by W. T. Henley's Telegraph Works Co., Ltd., Woolwich, and the third place is shared equally by Edward George Rippin, employed by O.C.38 Base Workshops, R.E.M.E., and Brian England, employed by Yarrow & Co., Ltd., Scotstoun, Glasgow. The Court expresses its thanks to Mr. H. S. Pocock and Mr. R. L. Garrett for again acting as assessors.

Following the death of Mr. F. Grindrod, managing director and co-founder of Hardman & Co., Ltd., Rochdale, **Mrs. L. Grindrod** now becomes chairman, **Mr. R. H. Corlett,** managing director, and **Mr. H. Smith,** director, of Hardman & Co. and Philco Distributors (Lancashire), Ltd. **Messrs. G. A. Hawdon, S. Isherwood** and **A. C. Harte** become executive directors of Hardman & Co., and **Messrs. S. Isherwood** and **J. A. Calvert** executive directors of Philco Distributors (Lancashire), Ltd.

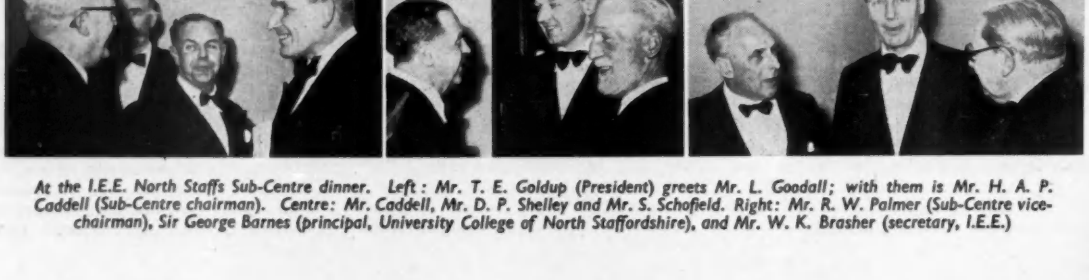
Mr. W. Woods-Hill has been appointed by the Microcell Group as manager of computer developments.

Mr. T. H. West has been appointed press relations officer to E.M.I. Electronics, Ltd. Mr. West will be responsible for co-ordinating all the company's publicity activities.

Mr. N. F. Brand, M.I.E.E., whose appointment to the board of Heyes & Co., Ltd., we reported in our last issue, has devoted his whole career to mining electrical engineering, and he joined the company in 1935 whilst a student of the Wigan and District Mining and Technical College and was lately chief engineer of the company. As a director he will be responsible for sales management. He is a member of the Association of Mining Electrical and Mechanical Engineers, and he saw war service with the Royal Tank Regiment and R.E.M.E., leaving the Army with the rank of major.

Mr. N. F. Brand

Mr. J. Heyes, who succeeds Mr. Brand as chief engineer, is no relation of the original founders of the company. He has been with Heyes & Co. since 1933, and has also served in the R.E.M.E., with the rank of captain.



At the I.E.E. North Staffs Sub-Centre dinner. Left: Mr. T. E. Goldup (President) greets Mr. L. Goodall; with them is Mr. H. A. P. Caddell (Sub-Centre chairman). Centre: Mr. Caddell, Mr. D. P. Shelley and Mr. S. Schofield. Right: Mr. R. W. Palmer (Sub-Centre vice-chairman), Sir George Barnes (principal, University College of North Staffordshire), and Mr. W. K. Brasher (secretary, I.E.E.)

He is an associate member of the Association of Mining Electrical and Mechanical Engineers.

The annual general meeting of the Kent Branch of the **Electrical Industries Benevolent Association** will be held on Wednesday, 30th April (2 p.m.), at the Oil Refinery, the Isle of Grain. A tour of the refinery and tea have been arranged to follow the meeting.

The annual ball of the Birmingham and District Branch of the E.I.B.A. will be held on 28th March in Tube Investments ballroom, Broadwell Road, Oldbury. Tickets (10s each) are available from Mr. G. D. Rogers, hon. branch secretary, the Electrical Trades Supply, Ltd., Albion Buildings, Loveday Street, Birmingham, 4.

The seventh annual conversazione and dance of the **I.E.E. London Graduates' and Students' Section** was held at Savoy Place on Friday last. The seventy-five exhibits on view during the evening included items from all branches of electrical engineering. There was also a film show and demonstrations of stereophonic and high fidelity sound reproduction. Dr. Willis Jackson represented the President of the Institution and Mr. Jervis Smith attended on behalf of the secretary.

Recently, Ruston & Hornsby, Ltd., announced that it was collaborating with J. L. Kier & Co., Ltd., on the design and development of small nuclear power stations of 5 to 25 MW generating capacity. Coincident with the company's developments in this field, and also with its rapidly expanding activities in the oil industry, **Mr. J. Albertini,** one of its chief sales executives, now relinquishes certain of his present duties to enable him to give undivided attention to these specialised fields. In addition, Mr. Albertini will be responsible for promoting the sale of Ruston gas turbines in the United States in collaboration with Clark Bros., of Olean, the company's American licensees.

Mr. J. Albertini

There was a gathering of nearly 600 at the annual luncheon of the **Electrical Trades' Commercial Travellers' Association** held at the Connaught Rooms, London, on Friday last week, under the chairmanship of Mr. F. A. Bartlam. The occasion was notable because the principal guest was Miss Mary George, Director of the Electrical Association for Women, who was the first woman to attend this annual event.

Miss George, in proposing the toast to the Association, said that commercial travellers were among the most important people in the industry to-day; the industry's success depended on their initiative. Theirs was the most exacting of all selling techniques as their results could be measured in hard cash. The E.A.W. had helped the commercial traveller by softening up the domestic market and she hoped he would reap a handsome reward.

A group at the annual luncheon of the Electrical Trades' Commercial Travellers' Association. Left to right: Mr. J. Murray, Mr. E. R. Stickley, Mr. W. S. Lewis (president), Mr. S. E. R. Barker (vice-chairman), Miss Mary George (Director, E.A.W.), Mr. F. J. E. Simons, Mr. G. F. Peirson (deputy chairman, Midlands Electricity Board), Mr. L. L. Hughes and Mr. F. A. Bartlam (chairman)

Speaking of the domestic electrical field, she said 92 per cent of homes had an electricity supply, but only one in ten had a refrigerator, one in six an electric washer and one in five a cooker or water heater. Consumers generally were not yet aware that the fuller use of electricity meant cheaper electricity. Miss George referred to the spirit of friendship which pervaded all sections of the electrical industry and which was particularly shown in such associations as the E.T.C.T.A.

Mr. W. S. Lewis (president), in a brief but lively response, said that the members of the Association were the backbone of the electrical industry. The electrical load had doubled in the last ten years and he forecast that it would double again in the next ten years. He said that he was pleased to be president of an association which was doing such magnificent work.

Mr. Bartlam proposed the toast to the guests, and Mr. G. F. Peirson (deputy chairman of the Midlands Electricity Board), in reply, spoke of the proposals for gas and electricity co-operation and said that before nationalisation Birmingham was proud of its two public utilities. He maintained that competition between the industries made for efficiency.

Earlier in the proceedings, Mr. S. Johnson (charity steward) made his customary appeal for the Association's charities—its benevolent fund, the Royal Commercial Travellers' Schools and the Electrical Industries Benevolent Association. He said that this was his twenty-fifth year as charity steward. This year the Association had donated £600 to its charities, and he referred to Mr. D. G. E. Barrie's generosity in supplementing this amount with donations to the E.I.B.A. totalling £1,000 (£500 from his company, Metway Electrical Industries, Ltd.), to mark his fifty years in the electrical industry. During the luncheon a total of £163 was collected for the Association's charities.

The North Western Branch of the Electrical Trades' Commercial Travellers' Association held its ladies' evening on 13th February at the Alma Lodge Hotel, Stockport. There was a good attendance and Mr. W. W. Blears, the chairman, welcomed members and their friends. Mr. W. S. Lewis (president) expressed his appreciation of the progress made by the Branch and referred to the efforts made for charity. The toast to the Association was proposed by Mr. F. Linley, manager of No. 1 Sub-Area of the North Western Electricity Board, and Mrs. J. C. Moston replied to a toast to the ladies. Many prominent members of the electrical industry and their friends were present.

Mr. W. N. Smithson, district commercial engineer at Darlington for the North Eastern Electricity Board, has retired after fifty-two years in the electrical industry. Mr. Smithson, who at one time was in business as an electrical contractor, became consumers' engineer with the Darlington Corporation in 1929 and in 1948 became district commercial engineer with the Board.

Mr. R. J. Ballard has been appointed sales manager of the Domestic Division of Creators, Ltd., and takes over from **Mr. D. I. Shakespeare,** who has now resigned his post with the company.

OBITUARY

Mr. Arthur Leonard Burnell, F.I.M.T.A., A.A.C.C.A., secretary to the South Eastern Electricity Board, died on 19th February after a short illness.

Mr. Burnell was born in St. Marylebone in 1904 and was educated at the Stationers' Company's School. He started his career with Hornsey Borough Council and afterwards served with Middlesex County Council and Watford Borough Council. He

was later selected as personal assistant by Mr. Arthur Collins, a recognised expert on local government finance. In 1930 Mr. Burnell joined the London and Home Counties Joint Electricity Authority and five years later was appointed finance officer to the Authority; he was made clerk and finance officer in 1946. On nationalisation of the electricity supply industry in 1948 Seeboard appointed him as its secretary. Mr. Burnell was a prominent member of the Institute of Municipal Treasurers and Accountants and was much in demand as writer and lecturer in the field of public administration. For many years he was honorary editor of the *Journal* of the National Association of Local Government Officers.

Mr. A. T. Ward.—The death occurred on 14th February, at the age of sixty-one, of Mr. Alfred Thomas Ward, M.Sc., F.R.I.C., who had been with the British Thomson-Houston Co., Ltd., Rugby, for thirty-five years, thirty-three of which had been spent in the research laboratory on insulation research.

The late Mr. A. T. Ward

Mr. Ward joined the company in 1923 as foreman of the Oil and Varnish Department and transferred to the research laboratory (insulation engineers section) in 1925. From the outset he was concerned with the development of synthetic resins and moulding powders. He was technically responsible for the quality of these products and had built up and maintained a close association with many manufacturers of mouldings all over the country. Mr. Ward received his early education at Derby Municipal Secondary School (1910-13) and Long Eaton Council School (1914-15). He served in the 1914-18 war with the Royal Artillery and on demobilisation in 1919 went to University College, Nottingham, where he remained until 1923. Mr. Ward was awarded a B.Sc. degree in chemistry with first class honours in 1922 and proceeded to M.Sc. in 1924 for a thesis on research on acid dissociation constants and pH values of solutions of mixed acids. He became an Associate of the Royal Institute of Chemistry in 1924, followed by Fellowship in 1945, and was awarded the Associateship of the Chemical Society in 1931.

Mr. E. C. Inston, liaison officer in the United Kingdom for the Electricity Corporation of Nigeria, died on 23rd February.

Mr. James R. Farr, who was assistant mains engineer and substation engineer at Halifax when he retired in 1949, died in a Greenock hospital on 18th February. Before going to Halifax in 1923 as a mains engineer, he was with the former Clyde Valley Electrical Power Co. in Glasgow.

Mr. Joseph Millet, founder of J. Millet (Electrical), Ltd., died on 18th February at the age of eighty-six. He commenced business in the wholesale domestic lighting and electrical trade in 1914.

WILLS

Mr. H. H. Cressall, founder of the Cressall Manufacturing Co., Ltd., who died on 1st November last, left £71,583 gross (£69,054 net).

Mr. T. B. Nutter, former borough electrical engineer of Burnley, who died on 14th September last, aged 75 years, left £4,649 gross (£4,612 net).

Mr. E. T. White, chairman and joint managing director of Ashley Accessories, Ltd., chairman and director of Astral Switchgear, Ltd., and of V.G. Porcelain Co., Ltd., and director of other concerns, who died on 24th September last, left £46,984 gross (£42,176 net).

Mr. L. W. Sansum, F.C.C.S., late director, general manager and secretary of A. F. Bulgin & Co., Ltd., who died on 15th October last, left £23,006 gross (£21,722 net).

R.C.A. Indicted

Violations of the United States anti-trust laws are alleged to have been perpetrated by the Radio Corporation of America in an indictment brought before a Federal grand jury last week by the United States Attorney-General (Mr. William Rogers). The accusations are that the R.C.A., sometimes in conjunction with other companies, has monopolised radio, television and other electronic patents or has released patents on condition that the licensee took on hundreds or even thousands of patents for which he had no use; and that the company has formed restrictive cartel agreements with firms in Great Britain, Holland and Germany.

The R.C.A. has issued a statement in which it claims that it has licensed all comers under all patents which it operates and that it has been largely responsible for the creation and expansion of the gigantic American electronics industry.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £163 10s 0d
Fire Refined 99·70%	ton £162 0s 0d
Fire Refined 99·50%	ton £161 0s 0d
COPPER Tubes ..	lb 1s 7½d
Sheet	ton £190 0s 0d
H.C. wire and strip ..	ton £212 15s 0d
LEAD, English ..	ton £75 15s 0d
Foreign	ton £74 0s 0d
MERCURY	flask £76 0s 0d
TIN, block (English) ..	ton £735 10s 0d
ZINC, G.O.B. Foreign	ton £63 15s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 4½d
Sheet	ton —
Wire	lb 2s 2½d
PHOSPHOR BRONZE Wire	lb 3s 4½d
PLATINUM	oz £26 15s 0d
RUBBER, No. 1 R.S.S. spot	lb 22½d—23d

C.E.G.B. Contracts

The Central Electricity Generating Board has placed contracts during the past two months for power stations, transmission lines and transforming stations amounting in the aggregate to £8,973,200. The principal contracts are as follows:—

Barking "C" power station: 132 kV and auxiliary cables.—Pirelli-General Cable Works.

Plymouth "B": Superstructure.—A. N. Coles (Contractors).

West Thurrock: Steel reinforcement.—Whitehead Iron & Steel Co. Pile casting and pile driving.—Holloway Bros. (London).

Staythorpe "B": Main and auxiliary circulating water pipework.—T. B. Pearson & Sons.

Willington "A": Vacuum cleaning plant.—B.V.C. & Engineering Co.

Aberthaw: Foundations, culverts, etc.—John Morgan (Builders).

Uskmouth "B": Pumping station.—Holloway Bros. (London).

Blaenau Ffestiniog: Two 160 MVA, 275/16 kV generator transformers and earthing transformers.—Ferranti.

Fleet substation: Two 180 MVA, 275/132 kV transformers.—Hackbridge & Hewittic Electric Co.

Melksham substation: 275 kV switchgear.—Metropolitan-Vickers Electrical Co.

Berkeley substation: Site and foundation works.—Wm. Cowlin & Son.

Liskeard substation: 132 kV switchgear.—British Thomson-Houston Co.

Plymouth substation: 132 kV switchgear.—General Electric Co.

Barton substation: 132 kV switchgear.—Metropolitan-Vickers.

Connah's Quay "B" substation: 275 kV switchgear.—English Electric Co.

Crewe substation: 132, 33 and 25 kV cables.—Pirelli-General Cable Works.

Kirkley and Gloucester substations: Site and foundations work.—A. Monk & Co.

Northfleet: 132 kV and pilot and control cables.—British Insulated Callender's Cables.

Ripple Lane, Barking: 132 kV overhead line deviations.—Watshams.

Marchwood-Fleet: 132 kV overhead lines.—Balfour, Beatty & Co.

Liverpool (Childwall—Vulcan Street): 132 kV cables.—Enfield Cables.

Hounslow-Ealing: 66 kV, 22 kV and multi-core cables.—British Insulated Callender's Cables.

Hinkley Point-Melksham: 275 kV overhead line.—British Insulated Callender's Construction Co.

Dungeness: 160 MW, 200 kV d.c. rectifier equipment for the cross-Channel connection.—A.S.E.A., Sweden.

OVERSEAS ELECTRICAL TRADE

EXPORTS EXCEED £20 MILLION IN JANUARY

THE current year has started well for British electrical exporters, the total value of electrical machinery, apparatus and appliances in January amounting to £20,021,731, as compared with £16,989,763 for January, 1957, and £18,905,359 for January, 1956. The month's total was also over £2 million better than for December last year. As compared with January, 1957, all the main groups of electrical equipment shared in the increase, heavy electrical equipment (generating plant, transformers, rectifiers, switchgear, etc.) rising by nearly £1·5 million, radio equipment by £300,000, telegraph and telephone apparatus by £400,000 and cables and wires by £300,000.

With the publication of the January figures each year, some additions and reclassification of existing items are usually made in the Board of Trade returns, and following a suggestion made by the *Electrical Review*, electric wiring accessories are shown separately for the first time. It will be seen from Table I that the value of this class of electrical goods in January (£96,263) was four times greater than the figure of £24,058 for January, 1957.

TABLE I.—ELECTRICAL EXPORTS

Class	Month ended 31st January 1957	1958
	£	£
Generating sets and generators:		
Diesel-driven, up to 10 kW	148,120	113,498
Ditto, 10 to 65 kW	137,802	162,574
Ditto, 65 to 200 kW	75,832	158,214
Ditto, over 200 kW	242,379	334,998
Spark ignition engine driven	9,834	14,192
Steam turbine driven	24,818	16,235
Hydraulic turbine driven	—	—
Other prime mover driven	10,781	16,480
Generators, not exceeding 200 kW	205,644	186,609
Ditto, over 200 kW	31,479	98,108
Parts of generators	308,337	490,139
Motors, complete, other than railway, tramway and trolley-bus:		
Up to ½ h.p.	181,765	158,817
Over ½ but under 1 h.p.	42,076	87,112
1 h.p. to 250 h.p.	458,509	535,539
Over 250 h.p.	160,182	142,114
Railway, tramway and trolley-bus motors complete and parts of all motors	153,797	189,654
Motor starting and controlling gear	241,617	311,447
	2,432,972	3,015,730
Converting machinery	131,285	44,123
Mercury-arc rectifiers	31,884	105,786
Transformers for lighting, heating and power (incl. coils):		
Not exceeding 7,500 kVA	358,844	726,564
Over 7,500 kVA	202,023	282,414
Switchgear and switchboards (not telegraph or telephone), up to 200 A and 660 V	263,731	557,844
Ditto, other	906,353	1,057,145
	1,894,120	2,773,876
Primary batteries:		
Lighting	95,532	100,045
Radio	308,942	287,543
Other	36,386	54,998
Parts (excl. carbons)	48,042	52,167
Lamps:		
Filament, exceeding 28 V	74,293	94,485
Ditto, under 28 V	31,495	22,973
Arc lamps and searchlights	11,268	15,012
Discharge lamps, fluorescent tubes, etc.	94,250	85,297
Radio and television, etc., apparatus:		
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury arc rectifiers), photo-electric cells, stabilising and cold cathode valves, magnetrons, klystrons	24,011	28,884
All other	241,525	328,394
Parts (excluding glass bulbs)	7,869	13,187
Radio and television transmitters	93,101	27,560
Commercial radio and radar equipment	1,095,124	1,283,884
Domestic radio receivers, mains	97,720	82,825
Ditto, battery	47,028	59,600
Ditto, other (incl. car)	26,336	36,723
Radiograms	21,881	51,850
Television sets	70,758	123,649
Public address equipment	101,979	110,159
Other radio and television apparatus, n.e.s.	64,426	25,577
Components and parts, n.e.s.	773,451	785,965
	2,665,209	2,958,257
Telegraph and telephone installations	818,059	1,102,443
Telephone instruments, separately consigned	138,592	264,440
Telegraph and telephone parts	758,544	739,834
Line apparatus for long distance communication	130,556	161,979
	1,845,751	2,268,696

Class	Month ended 31st January 1957	1958
	£	£
Cookers	57,170	57,812
Toasters	14,911	31,364
Other cooking apparatus	26,131	38,715
Parts and accessories	72,111	72,619
Space heating appliances	38,538	39,831
Water heating appliances	22,933	21,782
Other heating appliances	31,393	35,673
Parts and accessories	60,242	55,477
Irons	61,220	120,110
Arc welding equipment, a.c.	50,827	84,261
Ditto, d.c.	48,785	24,592
Resistance welding equipment	16,303	11,968
Electric furnace plant	108,986	57,633
Magnetos, ignition	38,089	20,117
Sparking plugs	174,802	124,911
Elec. appliances for aeroplanes, n.e.s.	230,263	246,041
Ditto, for motor vehicles, n.e.s.	318,810	383,446
Ditto, for cycles, n.e.s.	38,692	57,160
Signalling app. (incl. traffic signals)	84,752	186,452
Instruments, commercial	162,426	162,398
House service meters (including parts)	147,683	165,524
Electro-medical apparatus (not X-ray)	29,181	50,131
X-ray apparatus (excl. tubes and valves)	59,979	64,090
Vacuum tubes	27,019	40,177
Ceiling fans, complete	98,152	78,614
Desk fans, complete and parts of desk and ceiling fans	23,683	34,938
Vacuum cleaners	155,956	185,813
Floor polishers	84,628	68,921
Food mixers	54,773	46,644
Hair clippers and dry shavers	133,138	84,943
Other portable appliances	29,632	26,919
Parts	132,302	166,804
Portable elec. tools (not saws) and parts	207,246	262,384
Cables and wires:		
Telegraph and telephone, submarine	89,758	14,051
Ditto, other	1,029,064	1,047,386
Cotton, silk or art. silk insulated	31,109	31,941
Enamel, glass or asbestos insulated	82,793	99,131
Paper insulated	512,864	637,220
Rubber insulated	613,984	572,287
Thermoplastic insulated	141,169	266,470
Other	165,070	311,809
	2,665,811	2,980,295
Accumulators for motor vehicles	121,209	124,364
Ditto, traction	32,478	13,988
Ditto, radio and other portable	63,944	45,771
Ditto, other	31,754	30,773
Parts and accessories	108,955	118,865
Electric wiring accessories	24,058	96,263
Elec. porcelain, etc. (incl. insulators), n.e.s.	102,641	83,748
Insulating cloth and tape	72,664	50,083
Other insulating material	100,902	96,761
Permanent magnets	40,309	43,393
Radio, telegraph and telephone testing equip., n.e.s.	38,647	52,490
Scientific elec. instruments (not telegraphic or telephonic):		
Time recorders and time switches, complete	14,253	30,008
Other	339,328	307,575
Electrical machinery, n.e.s.	58,305	87,138
Electrical apparatus and appliances, n.e.s.	795,489	1,022,873
TOTAL	16,989,763	20,021,731

TABLE II.—DISTRIBUTION OF EXPORTS OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	Jan., 1957	Jan., 1958	Country	Jan., 1957	Jan., 1958
	£	£		£	£
Channel Islands	95,476	115,289	Netherlands	666,134	587,049
Gibraltar	10,878	27,396	Belgium	331,126	323,054
Malta and Gozo	34,004	40,609	France	399,987	417,362
Cyprus	128,462	96,511	Switzerland	128,912	126,235
Sierra Leone	38,725	67,711	Portugal	199,198	522,894
Ghana	187,881	191,558	Spain	379,310	178,100
Nigeria	332,195	343,658	Italy	290,441	300,615
Union of South Africa	1,415,619	1,777,327	Austria	20,650	62,067
Rhodesia and Nyasaland	505,651	497,138	Yugoslavia	26,897	56,509
Tanganyika	38,929	55,161	Greece	78,577	131,547
Kenya	124,864	158,350	Turkey	11,902	86,495
Uganda	62,791	87,704	Belgian Congo	43,421	40,711
Mauritius	21,366	21,489	Portuguese East Africa	25,177	17,824
Aden	30,703	53,471	Egypt	551	21,659
Bahrain, Qatar and Trucial States	5,768	112,512	Libya	16,607	48,304
Kuwait	71,611	206,690	Southern Morocco	59,515	14,450
India	1,759,312	1,749,953	Sudan	148,358	58,394
Pakistan	141,580	324,565	Syria	48,065	21,052
Singapore	365,063	268,967	Lebanon	37,782	61,896
Federation of Malaya	357,419	276,731	Israel	64,703	88,680
Ceylon	170,119	124,453	Jordan	62,157	39,301
British North Borneo	9,632	31,668	Saudi Arabia	40,542	127,941
Sarawak	31,683	12,104	Iraq	273,370	404,899
Hong Kong	292,614	235,873	Iran	233,971	539,849
Australia	1,483,604	2,092,915	Burma	46,444	99,378
New Zealand	1,039,738	1,398,334	Thailand	73,211	202,350
Fiji	19,661	22,820	Indonesia	102,539	31,773
Canada	923,566	849,200	Japan	54,934	39,351
Jamaica	58,742	124,948	United States of America	691,794	573,185
Barbados	22,988	21,585	Cuba	38,115	138,532
Trinidad	95,720	102,283	Mexico	57,034	62,722
British Guiana	46,427	33,144	Colombia	46,896	51,934
Other Commonwealth countries	109,938	135,584	Venezuela	347,956	493,034
Irish Republic	218,090	269,360	Peru	70,077	40,423
Soviet Union	145,287	53,940	Chile	29,284	45,913
Finland	114,087	184,841	Brazil	37,008	100,698
Sweden	313,274	358,111	Uruguay	20,546	6,494
Norway	222,385	224,394	Argentine Republic	71,437	188,310
Denmark	130,779	198,100	Other foreign countries	254,994	353,318
Poland	31,519	136,661			
Western Germany	251,991	234,321	TOTAL	16,989,763	20,021,731

In the generating sets, generators and motors group, the best market in January last was Australia, which imported plant valued at £386,864. India held second place with purchases valued at £361,977 and South Africa was third with £247,846. These three Commonwealth countries were also the principal buyers of converting machinery, mercury-arc rectifiers, transformers, switchgear and switchboards, India taking equipment of this kind valued at £623,661, South Africa £450,604 and Australia £382,018.

France was the principal customer for radio and associated equipment in January, making purchases of £319,057, the Netherlands coming next with £183,972 and Australia third with £175,347. Shipments of telegraph and telephone equipment to Australia amounted to £437,575, South Africa took equipment valued at £273,848, and Portugal came into third place with purchases valued at £232,672.

In the cables and wires group India was the best Commonwealth market with purchases of £356,319, followed by New Zealand (£321,716). It is interesting to note that outside the Commonwealth, Venezuela increased its purchases from £140,921 in January, 1957, to £323,655 last month, while Portuguese imports rose from £19,119 in January last year to £207,406 last month.

The electrical exports are analysed in Table I and their destinations are shown in Table II. Other electrical equipment given in the returns, but not in the electrical section, includes the following; the figures for January, 1957, are shown in parentheses:—

Electric locomotives: January, £139,768 (£378,432). Locomotives with i.c. engines and electrical transmission: January, £146,776 (£182,987).

Electrically operated washing machines, complete, not exceeding 150 lb net weight: January, £262,585 (£384,457); Ditto, 150-250 lb: January, £75,246 (£99,434). Parts: January, £50,371 (£52,537).

Welding electrodes (excluding carbons), covered: January, £106,244 (£105,678).

Electric conduit tubes and cased tubes: January, £45,088 (£77,114).

Electric carbons (including parts): January, £59,085 (£62,003).

Electric lighting fittings and lanterns, complete, with or without bulbs (excluding arc lamps, searchlights and cycle lamps): January, £273,475 (£176,258).

Other electric lighting appliances (excluding vacuum tubes and lamp bulbs) and fittings and parts, n.e.s.: January, £165,309 (£250,600).

Electrical Imports

Imports of electrical goods in January totalled £2,420,917, as compared with £2,255,456 for January, 1957. As for some time past, the principal group of imports was radio and associated equipment. The United States, which supplied goods valued at £671,896, continued as the principal exporter, followed by Western Germany with £439,842 and the Netherlands with £374,867.

Nuclear Power Station for Japan

LAST week it was announced by the Japanese mission on a visit of inspection to this country that it had been decided to ask three British nuclear energy groups to quote for the provision of a 150 MW nuclear power station with a reactor of the Calder Hall type. The organisations in question are the G.E.C.–Simon-Carves Group, the A.E.I.-John Thompson Nuclear Energy Co. and the English Electric-Babcock & Wilcox Group. The fourth large British nuclear power consortium—the Nuclear Power Plant Co.—is already committed to a 200 MW station for Italy.

Special construction will be employed to ensure the safety of the plant during earthquakes and a specially developed emergency shut-down system will be installed.

Tenders are to be submitted by 31st July and a decision will be made, it is said, about a month later. The United Kingdom Atomic Energy Authority will supply the uranium for the reactor and process the spent fuel.

Progress at Hunterston

FOUNDATION WORK WELL AHEAD

The concrete batching plant installed alongside the site of reactor "A"

IN the course of the past few months the 70-acre site of Scotland's first nuclear power station at Hunterston, on the Ayrshire coast, has become a scene of great activity with more than a thousand men at work. Permission to begin permanent work was not granted until the middle of October; by that time, however, 1½ miles of temporary road had been laid to permit the access of heavy civil engineering equipment, and much work had been done to confirm and extend existing information about the rock formation. The power station is being built for the South of Scotland Electricity Board by the General Electric Co., Ltd., in association with Simon-Carves, Ltd., the Motherwell Bridge & Engineering Co., Ltd., and Mowlem (Scotland), Ltd.

During the first year on site, the emphasis on temporary works is necessarily greater than in subsequent years, but the early stages of the main constructional programme are proceeding according to schedule. Attention has been concentrated largely on the foundations of the first reactor and the turbine hall.

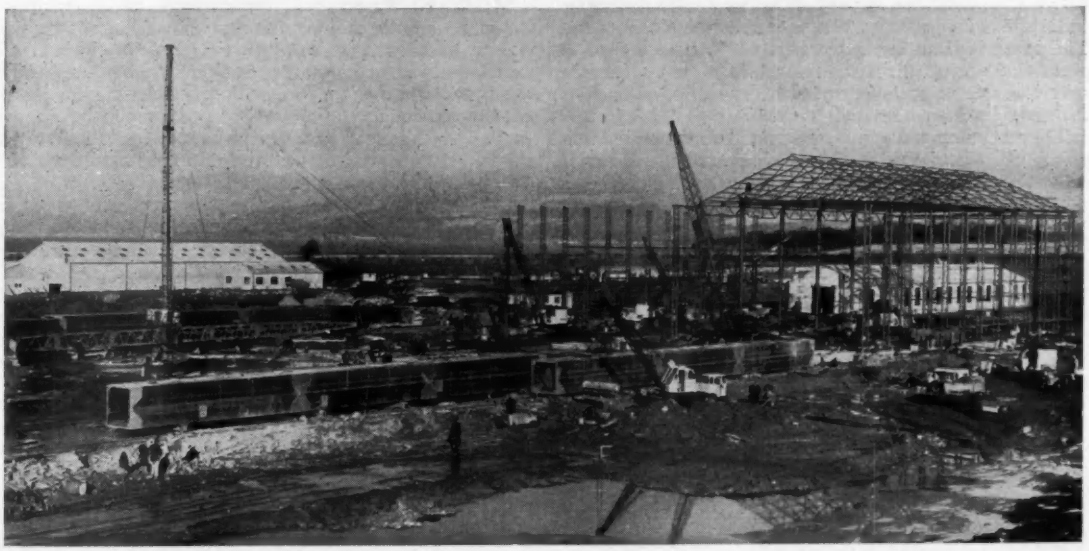
Having removed, on average, 8ft of surface soil and green rock at the reactor base, blasting and excavation began on the foundations to cut out any faults and to produce a level surface preparatory to mass concreting. This mass concreting, involving the pouring of 3,000 cu yd of concrete, has now been completed and work has started on the reinforced concrete raft above it. The raft will incorporate 8,000 cu yd of concrete with 400 tons of reinforcing steel. Apart from the cranes already being used for transferring the concrete from the batching plant to the reactor base, two of the four derricks required for erecting the main concrete structure are now almost complete.

The turbine hall excavation, covering an area approximately 675ft by 130ft and going to a depth of about 13ft, is now practically finished, and work has started on the cooling-water inlet culverts. To eliminate the need for blasting in the vicinity of the first reactor once the structural concrete has been placed, the excavations for the irradiated-fuel storage pond have also been completed. However, as this area will be required for precasting the heavy concrete beams of the reactor building, the loose rock has been replaced for the time being.

In preparation for the cooling-water inlet and outlet works, a series of boreholes have been sunk off the coast, and others are still being made.

The presence of a rock base very near the surface is a valuable asset for the foundations of the heavy structures,

Steelwork in course of erection for the workshop in which the steam-raising units are to be assembled on the Hunterston site. In the front of it, on each side of the pressure-vessel prefabrication apron, can be seen sections of the legs for the 350-ton Goliath crane



One of the four derricks which will be used for placing the main structural concrete

but may introduce slight difficulty in connection with sewers and drains. Particular attention has therefore had to be given to the planning and phasing of this work, but most of the necessary blasting has now been finished. Surface-water drainage has been a problem owing to the large quantities involved; a 21in main drain has been installed to meet this requirement.

To ensure that the civil engineering activities can continue unhindered by work on the main steel structures, a complete workshop and prefabrication apron are being constructed on site. The workshop, which is now approaching completion, will be a twin-bay, steel-framed building served by two 40-ton travelling cranes. It is designed so that four steam-raising units, each 80ft long and 20ft in diameter, can be assembled simultaneously. The apron in front of the workshop will be used for the prefabrication of the six tiers of each 70ft diameter spherical reactor pressure vessel before lifting them into their final position.

The workshop and apron are situated on the centre-line of the two reactors so that the Goliath crane, which will be used for raising and placing the steam-raising units and pressure-vessel sections, will pass over these construction areas. This crane, which will be the outstanding piece of constructional equipment employed on the site, will have a height and span of 200ft, so that it can straddle a completed reactor building, and will be capable of lifts up to 350 tons. The massive prefabricated sections of the crane legs are already being assembled on site and the bogies on which they will be mounted are in position on their tracks ready for erection to begin.

A great deal of work has been involved in the provision of temporary buildings and services. For instance, an 11 kV electrical distribution system has been installed and is being extended, as required, to allow for an expected total capacity of 10 MVA. One rather unusual load on this system is a 500 kW heater in a 12,000 gal water tank which supplies the concrete batching plant. This heater raises the temperature of the water almost to boiling point so that concreting can continue even with a slight frost.

A block of temporary offices has been erected to the south of the site to house the engineering staff and to provide such facilities as drawing offices and a telephone exchange.

Among the other temporary buildings which have been completed, there are several well-heated stores and also a well-equipped small workshop with facilities for manufacturing practically any small machine components or fabrications.

Television Viewing Distance

DISCUSSION of the paper on "The Relation Between Picture Size, Viewing Distance and Picture Quality," which was given by Mr. L. C. Jesty before the Institution of Electrical Engineers on 19th February and summarised in our last issue, was opened by Mr. G. G. Gouriet, who disagreed that the upper half of the present video bandwidth was put to very little purpose. Many people had struggled to preserve the last db out of 3 Mc/s and it was disconcerting to be told it was in vain.

Mr. I. J. P. James considered that noise should be taken into account in assessing bandwidths and the quality of the picture. It was also important in tests to make sure that the systems were interlacing correctly, and the author had obviously taken that into account.

Mr. M. W. Baldwin, in a written communication read by Mr. H. Stanesby, questioned whether the juxtaposition of optical and television data (Fig. 6 of the paper) was a reliable guide to numerical conclusions about scanning standards.

Mr. T. Kilvington was particularly interested that the author had taken line structure into account. In the past it had generally been taken for granted and pictures had been assessed on the level of brightness. Care had also been taken to see that the interlacing was good.

Mr. B. C. Fleming Williams said that while the standards a quarter of a century ago had stood the test of time well, the time was ripe—with present techniques—to reconsider them. In this connection, the author, even though one might disagree with him, was doing valuable work.

Mr. S. N. Watson said the evidence presented was consistent and logical, but the author had not shown his viewers a sufficient range and type of picture. The aerial installation and feeder and connections could reduce bandwidth, as could the fact that the average television receiver got no maintenance until it broke down completely. Bandwidth was therefore likely to be reduced to about two-thirds. Another factor was the effect of distortions on the quality of pictures.

Mr. D. Maurice said that in his view an enormous price had been paid for interlacing and someone ought to attack it seriously. Viewers would be obliged to move a long way back to avoid looking at interlace lines.

Mr. P. P. Eckersley asked whether less bandwidth would not give less information. Was not Mr. Jesty making the best of a bad job and would it not be better to stick to 3 Mc/s and have a good job?

Mr. W. Sprowson said that in experiments he had done line visibility correlated well with the distance of viewing, and a slight extrapolation of the results gave nine times the picture height as the distance if the lines were just perceptible.

Mr. D. C. Birkinshaw emphasised the importance of line structure and suggested that if tapes had been insisted on from the start it might have been better.

Nuclear Power Development

SURVEY OF THE FIRST TEN YEARS' WORK

A TRUE story of "rags to riches in a decade" was told to the Institute of Fuel last week, when Sir Christopher Hinton, K.B.E., F.R.S., F.Inst.F., chairman of the Central Electricity Generating Board, delivering the Melchett Lecture, described how the United Kingdom atomic energy organisation began with virtually nothing in 1945 and by 1957 had established world leadership. Sir Christopher was until recently managing director of the Industrial Group of the United Kingdom Atomic Energy Authority.

Sir Christopher said that the McMahon Act, which was passed in America, virtually stopping all technological information from America, "was the greatest blessing which could possibly have befallen us." If that Act had not been passed it was inconceivable that they would not have been forced to follow American opinion, however ill-advised they might have thought it. As it was, they had to think for themselves, and it was by thinking for themselves that they evolved the approach which had led to their present leadership.

Sir Christopher described the original directive to build a single graphite-moderated, water-cooled reactor for the production of plutonium with plant for the manufacture of the uranium fuel elements and other plant for the chemical extraction of the plutonium from them.

Early Work

He paid a tribute to Imperial Chemical Industries when speaking of the early work, commenting, "Their contribution to the early development of atomic energy can never be sufficiently realised." Speaking of the early work on the extraction of uranium from ore, he gave some startling examples of how vital decisions had to be taken on the minimum of information. "I remember how we made the decision to order a bank of large Johnson filters on the basis of a sample of sludge in the bottom of a 4 oz bottle," he said. "No greater quantities were available."

Another of the problems encountered at Risley was that by the end of 1946 only one or two people with chemical plant design experience had been willing to join the organisation. "The average age of the people in the engineering department at that time was 24," he said. Moreover, they had no files of drawings of previous plant and every detail of plant had to be designed on a clean sheet of paper.

The toxic hazard of handling uranium faced the designers with the problem of designing plant for handling radioactive material on a scale of which there was no previous experience in this country, and it was decided that safety must be assured essentially by plant design and not by the use of protective clothing. Only in the most exceptional cases would conditions be accepted which made the continuous use of breathing apparatus necessary, and when the factory went into use only one man needed to use such apparatus throughout his duty.

Sir Christopher said that the first two bars of uranium were finished in October, 1948, two-and-a-half years after the office had opened at Risley, which was a creditable performance. At the same time, work had been proceeding on the design of the large air-cooled, graphite-moderated experimental reactor for Harwell. "The important lessons that we learned in designing this reactor," he said, "were how to arrange plant in such a way that its extreme simplicity gave a guarantee of freedom from breakdown and how far we could depart from engineering perfection without impairing performance. The Harwell pile was completed within a few days of the date laid down in February, 1946, only four days after the new department had been formed."

Although the original instruction had been to build a graphite-moderated, water-cooled reactor, it was known that these reactors were inherently unstable and needed to be sited in remote areas. It was also known that the Americans had been deterred from building a gas-cooled reactor by the difficulty of obtaining the large blowers for the gas circulation and it was believed that the problem of removing heat from such a reactor could be reduced by putting the gas under pressure.

Air-Cooled and Gas-Cooled Reactors

This led to a proposal to meet the plutonium requirement in two stages—first, an air-cooled reactor and, secondly, a reactor cooled by gas under pressure. Although this was turned down because of the urgent need of plutonium, work on the gas-cooled reactor continued and a complete scheme was worked out by the end of 1952.

Meanwhile, the plutonium requirement had to be met by the construction of reactors cooled by atmospheric air, and this led to the Windscale piles. These aimed at being scaled-up versions of the Harwell reactor and had a degree of simplicity which would minimise the chance of failure. It was realised that an occasional failure of fuel elements might lead to uranium contaminated with fission products being oxidised and carried up the chimney, but it was not until later that it was learned from American experience that the products of combustion from damaged fuel elements were of comparatively large particle size and might fall out on the surrounding land.

This new information led to the conclusion that there must be additional provision for the detection of failure of fuel elements, and it was decided to insert a moving monitor apparatus into the back of the reactor to sample rows of the 3,000 channels. "We ultimately took this decision only a week before the reactor started up, after spending miserably uncomfortable hours observing the behaviour of the equipment from inadequate shelters in the discharge duct while the blowers worked on full power, drenching us with water from the canal and exposing us to an air flow of hurricane force. Experience in operation has more than justified the decision."

Commenting on the work on fast reactors, he said: "I believe that our judgment in turning to fast reactors was sound. Fast reactors will be required industrially by about 1965 when by-product plutonium in considerable quantities will become available from the industrial reactors of the Calder Hall type. The progress being made at Dounreay will leave no margin for meeting this date."

But it was questionable whether the next prototype fast reactor, which must precede the first industrial fast reactor, would closely resemble the Dounreay design. "Dounreay looks too complicated to me," he said. "All atomic energy plant which has been successful has looked simple.

The Dounreay fast reactor does not look simple and that is why I think a revised approach may be necessary."

Sir Christopher said that the major problems of the early years of the organisation had arisen from the fact that they were a small organisation working against an almost impossible timetable with incomplete knowledge. In those days, they had had to press on to meet the target date for the production of plutonium. By taking a wrong decision they might fail to meet that date, but by waiting until all was clear they had no hope of meeting it.

"As an organisation grows in maturity and size," he said, "this approach should become less necessary, but it inevitably becomes less possible. As an organisation becomes anchored to an immense capital investment there is a growing danger that the load of its financial responsibility will stifle its initiative. This can be avoided only by careful and intelligent planning of the research and development programme. Research, development and large-scale trial must move sufficiently in advance of the industrial programme to enable progress in the programme to be made without accepting financial risks of such magnitude as to make it impossible to justify them."

Mr. H. McNeil, president of the Institute, presided over a meeting which was so well attended that the large hall at the Institution of Civil Engineers was crowded and the lecture was relayed to an overflow meeting.

Electrical Research Reports

AMONG the research reports which have been issued by the British Electrical and Allied Industries Research Association during the last few weeks Ref. N/T74, "Some Magnetic Properties of Dilute Anisotropic Ferromagnetic Alloys," by Prof. W. Sucksmith (price 6s) is concerned with the magnetic properties of very small particles of iron which are precipitated out of dilute solid solution in copper. An apparatus is described for measuring resonance and coercivity in the very low intensities of magnetisaton encountered. The work described in report Ref. N/T64 has been extended to the development of anisotropic alloys with high coercivities produced by cold drawing of the alloys. The results are discussed in the light of existing theories.

Wind Driven Generators

In report Ref. C/T116, "The Testing of Wind-Driven Generators Operating in Parallel with a Network," by D. E. Villers (price 18s) a brief review of the problem of testing full-scale wind-driven generators, under natural wind conditions, shows that the steady-state relationship between generator output and wind speed may be found by a simple method.

Tests carried out on a 10 kW machine connected to the public supply network are described and the results are compared with the calculated output characteristics of the machine. Suggestions are made for further work on the testing of wind-driven machines connected to a network or running in isolation.

Copies of the above reports are available at the prices indicated in parenthesis, postage extra, from the E.R.A. at Cleeve Road, Leatherhead, Surrey.

Reverse Driving of Short Arcs

Cobine and Gallagher made comprehensive investigations of the dependence of reversal conditions on current, magnetic field, pressure, nature of gas and cathode material. Himler and Cohn discovered that another parameter affected the reversal of an arc, namely the separation of the electrodes. They found that when the distance between the electrodes of a short copper arc in air was decreased there was an increase in the pressure necessary to change the current direction. They used an arc current of 7·5 A, weak magnetic fields of <40 gauss and separations of 1·5 to 6 mm.

Yamamura made experiments on short copper arcs and from his curves one can deduce an increase in reversing pressure as the separation was decreased. It should also be mentioned that Smith, using a low-pressure mercury arc, had observed that "the retrograde motion . . . persists or even increases as the anode is brought close to the cathode."

In Ref. L/T341, "Reverse Driving of Short Arcs," by A. E. Robson (price 6s) a description is given of investigations into the motion of a copper arc in atmospheric air, varying the separation of the electrodes between 0·5 and 2 mm, the current from 0·5 to 5 A and the magnetic field up to 5,000 gauss. The work was carried out at the Clarendon Laboratory, Oxford.

Glass-to-Metal Seals

Ref. D/T102, "Synthetic Resin Cements for Glass-to-Metal Seals for Use in Flameproof Enclosures," by H. F. Church (price 6s) describes a preliminary examination of the properties of polyester, ethoxyline and thiokol resins and compounds and draws conclusions as to their suitability for use in cementing glass to metal in windows in flameproof enclosures.

South Western Board's New Organisation

THE South Western Electricity Board is to introduce a simpler form of organisation in its Area from 1st April next. The purpose is to shorten the chain of management and it will gradually reduce the number of the Board's Districts from 19 to 12.

At present there is a "three-tier" management—at District, Sub-Area and Head Office levels, but the Board has decided that the Sub-Area offices shall cease to exercise managerial control over Districts from 1st April; instead, District managers will be directly responsible to the chairman of the Board.

The four Sub-Area managers—Mr. G. W. Richards (Bristol), Mr. E. A. Newburn (Somerset), Mr. G. T. Garwood (Devon) and Mr. C. J. Hocking (Cornwall)—with their wide knowledge and experience of local problems, will become advisers to groups of Districts from 1st April. The Sub-Area principal officers and their specialist staffs will become responsible to their respective chief officers at headquarters on a functional basis. The reduction of the number of Districts from 19 to 12 is to be achieved gradually over a period of time by amalgamation.

The Board says that the new organisation will ensure better management and service to consumers, with greater economy. No staff will become redundant; the Board's plans will enable the present staff to cope with the rapidly increasing volume of work resulting from the expansion of the Board's services.

Reducing Meter Reading

Interesting Experiment at Hamburg

By P. F. C. HOWES

THE alleged uneconomic overlapping of effort and the competitive propaganda carried on by the gas and electricity industries here has once again been the subject of comment in the Press and in Parliament, and as a result the Minister of Power is setting up a committee to examine the position.

The discussions lend interest to a method of payment for domestic electricity accounts which has just been adopted by the Hamburg electricity undertaking. This would seem to be one possible step towards the effective cutting down of accounting costs. After a careful analysis of the results obtained from experiments carried out with the approval of the 12,000 consumers residing in the Bergedorf district, the new procedure is now to be introduced to approximately 600,000 consumers in the Greater Hamburg area.

Fixed Monthly Payments

Briefly, the customer is levied with a fixed monthly tariff, based on his estimated total consumption for the year and related to earlier figures for electricity consumed. Every consumer pays, therefore, a fixed sum each month and apart from any control readings for special purposes, his meter is read only once in each year. It is pertinent to examine the advantages and disadvantages of such a system, and how it might be related to methods and conditions in Great Britain.

One disadvantage to the undertaking is that monthly or quarterly total sales figures will no longer be available. This might cause some difficulty when figures for generation, demand, the undertaking's own consumption, block tariff arrangements, and losses are required to be known. The economy achieved in outside services, moreover, would possibly be offset by the considerable amount of extra work thrown on the indoor staff, because of the need for keeping some sort of ledger account for each consumer. To carry out this work manually would certainly diminish savings made elsewhere. Frequent removals, the schedules for new meter installations, and any changes in tariff charges, all necessitate the interim balancing of accounts.

Whether small income groups would benefit by regular fixed monthly payments is hard to say: Hamburg seems to think that this new method, coupled with the virtual non-appearance of the man who reads the meter, will be a real relief to the harassed householder. Public meetings were held as a means of sounding the consumers' reaction to the plan. Two main points arose from these discussions.

Firstly, consumers expressed a strong wish to pay a constant monthly sum which would include both consumption and meter rental, and secondly, there was an underlying urge to cut down to an absolute minimum the visits of the "man at the door." This accorded well with the proposed plan, and the local Press was also sympathetic to the scheme. From a voluntary 70 per cent to begin with, 96 per cent of the tariff consumers in the Bergedorf district finally accepted and were charged in the manner described.

It is perhaps a reflection of the docile nature and orderly mind of the average German citizen that the Hamburg electricity authority found that payments were punctually made in nearly every case by those customers who had hitherto been used to waiting for the collector's call, and that in a majority of instances they were in fact ready to pay three, six or even twelve months' estimated amounts in advance, to save themselves the recurring trouble of remitting.

Moreover, at the end of the half-yearly accounting period in 1957, after a full year of experimental but compulsory acceptance, further debits to consumer accounts amounted to only 6·4 per cent, and credits to 6·9 per cent. There was, therefore, a slight balance in favour of the customers. Numerically, 40·8 per cent of all consumers received further payment demands, and 59·2 per cent credit notes in respect of the period.

The adoption of the Bergedorf plan for the whole of the Greater Hamburg zone rests on the almost complete use of a punched card system and the installation of a number of the most modern items of equipment (including three electronic punched-card units). Later on, if all expectations are fulfilled, an electronic storage computer is contemplated. This heavy expense can only be justified, however, if the capacity of such a machine can be fully employed, and its installation in the case of Hamburg would depend upon the devising and programming of new problems for automatic and rapid solution.

Estimated Savings

It has been calculated that there will be a saving by the adoption of the Bergedorf scheme of 45 per cent as against the old method, and that this saving might be increased when the scheme is fully operative. Frequent and regular interim meter readings, involving some 25 per cent of all consumers, are expected to be necessary at first, to avoid gross errors. The remaining 75 per cent of consumers' meters will be subject to control checks at irregular intervals, as expedient.

All the necessary machines and equipment for the extended scheme have been ordered, and in part, delivered. Arrangements have also been concluded with Hamburg banks to accept, without charge, payments made on the basis of the customer's punched card. Customers who have their own bank or savings bank accounts may give instructions to the electricity authority, allowing it to draw on their bank for the agreed instalments. Similar payment facilities are offered by the postal cheque system.

Full assurance has been given to the authority's staff that none of them will become redundant or suffer in his earnings from the scheme. It was also felt that this assurance would strengthen appreciation of the plan in any private discussions which might ensue. This endeavour was also supplemented by the publicity given to the scheme through the Press and broadcasting. Finally, the powers already granted to the authority under existing statutes were amplified by a clause setting out the objects of the new plan.

The authority recognises that this is a step which may be attended by some risk, and that its success can be judged only after a few years' operation. Full conversion is expected to take about one year, with a further short

period to overcome initial difficulties. The cost of the change-over will run into six figures in German marks, with some possibility of later economies in the work of the sales department.

Only experience can show whether, and to what extent, the new procedure will encounter hazards in the event of either an economic regression or the emergence of problems associated with wage fluctuations. The Hamburg electricity undertaking is quite confident about future developments, however, and it is convinced that the industry as a whole will benefit.

Is it too much to hope that bold schemes such as the one now outlined would contribute to the more economical running of services in our own country, or that if any such plan is drawn up, the attitude of the British consumer will not be to pay when he thinks proper, but rather, that any reluctance will be peacefully overcome by skilful inducements, allied to effective powers?

Recruitment and Training of Young Workers

EXISTING facilities for apprenticeship training are inadequate in quantity and, in some cases, in quality as well. The time has come for a fresh look to be taken at some of our existing practices if industry is to reap the full benefit from the increase in the number of young people leaving school over the next few years—the "bulge" as it is called. This is one of the main conclusions of the report of the National Joint Advisory Council's Sub-Committee on the Recruitment and Training of Young Workers in Industry (the Carr Committee), published last week for the Ministry of Labour and National Service by H.M. Stationery Office under the title "Training for Skill," price 2s 6d.

The Sub-Committee was appointed by the Council in the spring of 1956 "to consider the arrangements for the training of young workers in industry, with particular reference to the adequacy of intake into apprenticeship and other forms of training, in the light of the expected increase in the number of young persons entering employment and the need to ensure an adequate supply of trained workers for future needs." The Sub-Committee met under the chairmanship of Mr. R. Carr (Parliamentary Secretary to the Ministry) and comprised three representatives each of the British Employers' Confederation and the Trades Union Congress and two of the nationalised industries.

In an introductory chapter the report shows that for a few years only there will be a substantial increase at all ages in the number of boys and girls leaving school. The Sub-Committee says that the "bulge" will do no more than reduce the decline in the relative size of the country's labour force as compared with the total population. For the country as a whole, the problem presented by the "bulge" is not one of employment. It is how to ensure that the facilities for training over the next few years are adequate, both in numbers and in quality, to take advantage of the extra numbers of young people who will be entering employment during this period. There will be a particular need for an increase in the number of craft apprenticeships. This is a short-term problem; but failure to grasp the opportunities which it presents can have serious long-term consequences.

After examining the practice in certain foreign countries the Sub-Committee notes the growth of the apprenticeship system and says that we should build upon foundations that have already been laid rather than try to construct something entirely new. The efforts of the Government should be directed towards the expansion and improvement of the facilities for technical education, while the responsibility for the industrial training of apprentices should rest with industry.

The Sub-Committee has framed its proposals in the form of general recommendations which it asks each individual industry to consider. It says that there are no stereotyped arrangements that would meet the requirements of all sections of industry, and each industry is responsible for ensuring the adequacy of its own training arrangements.

In the main section of the report dealing with craft apprentices the Sub-Committee refers to the absence of reliable statistics and says that few industries were able to say with any precision how many craftsmen and apprentices they had. But signs were not wanting that the present intake was inadequate. The number of vacancies for skilled occupations notified to employment exchanges had for many years greatly exceeded the number of men in these occupations who were unemployed.

The Sub-Committee urges all industries to examine their needs for skilled workers in the future and to decide how they are going to train the extra numbers who will be needed. It states that the responsibility which an industry collectively has for the training of its young workers must in effect be a responsibility which is shared by each firm in the industry. It suggests various ways in which firms which do not at present train apprentices may be able to play their part in the future. These include group apprenticeship schemes, the provision of joint training centres, extended use of pre-apprenticeship courses and, for those firms unable to release their apprentices for further education on one day each week, the use of "block release" under which an apprentice attends classes whole time for a period each year equivalent to the time he would have spent under "day release."

The need for flexibility in apprenticeship schemes is stressed. The report suggests that there should be more variation in the upper age limit for entry to apprenticeship, and that the selection of apprentices should be systematic and appropriate standards set. It goes on to recommend that individuals should be equipped to meet technical change by training for a wider range of skill than has been customary in recent years, and adds that in considering the scope of training appropriate for a particular occupation, industries should regard the need to meet possible change as fundamental. Other recommendations on training are that more attention should be paid to the training of instructors in the art of instruction; that the length and scope of apprenticeship training should be reviewed; and that there should be closer co-operation between industry and those responsible for further education in the devising and conduct of educational courses.

Two further sections of the report deal with the development of training for non-apprentices, and opportunities for girls.

In order to follow up the recommendations in its report and to collect and disseminate information about those aspects of training which are common to more than one industry, the Sub-Committee recommends the establishment of a National Apprenticeship Council.

INDUSTRIAL NEWS

F.B.I. and the Budget

As is customary, the Federation of British Industries has sent to the Chancellor of the Exchequer its representations in advance of the Budget. Among the Federation's proposals is the assessment of depreciation allowances on a revaluation of assets, bringing their book value nearer to the present-day cost; greater flexibility in stock valuation; the use of a current-year basis for assessing companies' profits; better methods of dealing with overseas trading companies; the simplification of the treatment of employees' retirement benefits; and the abolition of the profits tax, or at least the substitution of a flat rate for the present differential rates.

As regards purchase tax the Federation deals with general principles, leaving to the industries concerned the study of the effect of the tax on their products. It suggests that the following matters are "ripe" for investigation:—The principles of classification for differential rates on chargeable goods; the complete absence of any statutory right of appeal against classification decisions by the Board of Customs and Excise; the absence of any right of draw-back of tax on taxed goods exported or returned to trading channels; the policy governing the registration of manufacturers and merchants; the charging of goods used up in industry; the confusion and waste of time caused by frequent changes in classification or rates of tax; and the registration limit of £500 turnover which leads to tax avoidance in certain trades.

The adverse effects on private companies of estate duty are also commented upon.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 14th February is deemed to be 186s 6d.

The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figure published on 14th February is 177·1. For turbo-generating and allied plant: Materials used in mechanical engineering industries 185·9, blast furnaces and iron and steel melting and rolling (40 and 41) 192·3. The price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 14th February) is 40¾d per lb.

Power Station Plant for Buenos Aires

The condensing, feed-heating, distilling and de-aerating plants, together with boiler feed pumps and circulating pumps, for the five 120 MW turbo-alternators for the new Buenos Aires power station will be manufactured by Worthington-Simpson, Ltd., who will also provide the circulating water pumps, screens and other equipment at the river intake. The complete contract for this station, which is being built for Agua y Energia Electrica (E.N.D.E.), Buenos Aires, has been awarded jointly to the British Thomson-Houston Export Co., Ltd., and the International Combustion Co., Ltd. Worthington-Simpson have collaborated in the B.T.H. portion of the scheme from the early stages.

Industrial Art Bursaries Competition

The Royal Society of Arts has announced the results of its 1957 Industrial Art Bursaries Competition. These include a bursary of £150 awarded in the domestic electrical appliances section to Miss P. V. Gibbs (L.C.C. Central School of Arts and Crafts), who is also awarded an associate membership of the R.S.A.; the entry by Mr. P. J. Collins (also L.C.C. Central School of Arts and Crafts) was commended. Mr. R. G. Wilkes (Kingston - upon - Thames School of Art) has been awarded a bursary of £150 in the electric lighting fittings section, and Mr. R. G. H. Callan (L.C.C. Camberwell School of Arts and Crafts) receives a commendation.

New Valve Factory

The Minister of Supply, Mr. Aubrey Jones, recently opened the new valve factory of Standard Telephones & Cables, Ltd., at Paignton, Devon.

The factory, which was built at a cost of £1·4 million, occupies a site of 46 acres, and concentrates on the production of special valves including s.h.f. valves for radar, water- and air-cooled transmitting valves and submarine telephone repeaters. The factory is built on steel piers to provide an area below the floor for all supply services. Cables are run through a system of under-floor tunnels for ease of maintenance and inspection.

University Scholarships

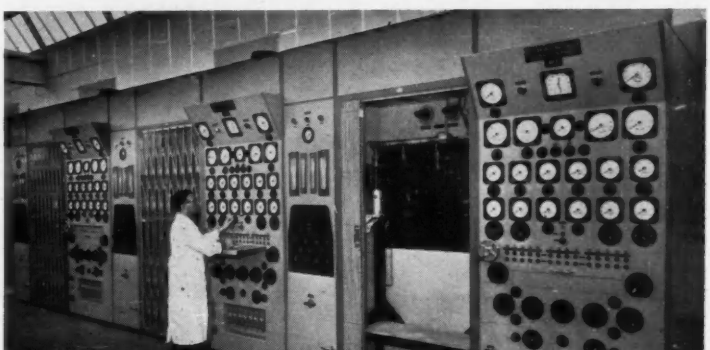
Referring to our notes on the English Electric Co.'s university scholarship scheme (*Electrical Review*, 21st February), the Ministry of Education tells us that the figure of £450 which the National Union of Students regarded as "an acceptable standard for full attendance at a university" did not include tuition fees or travelling expenses over £10, which are covered by State scholarships.

Production Exhibition

The Institution of Production Engineers has announced details of the Production Exhibition and Conference which it will be holding from 12th to 21st May this year. The Exhibition, to be held in the Grand Hall at Olympia, is the third of its kind. It will be divided into six main sections: production control; production in metals; services and aids to production; research and development; training and careers; and automatic production.

The subjects of the papers to be read at the Conference have been chosen to illustrate the theme of the Exhibition, namely, "Production Fights Inflation." The papers will deal with such subjects as the problem of selling in world markets; the economic background to production; designing machines for electronic control, etc.

Party visits are to be arranged and firms wishing to send representatives may apply for concession tickets to

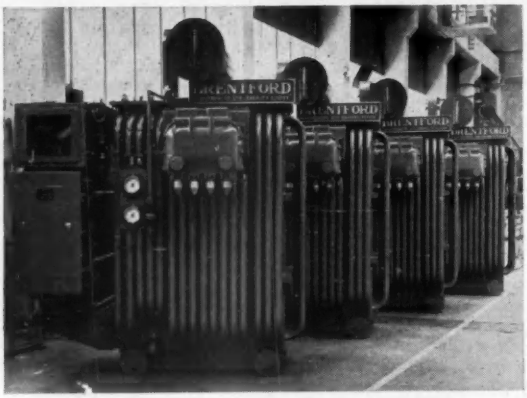


Valve exhausting stations at the Paignton factory of Standard Telephones & Cables

the Exhibition organisers, Andry Montgomery, Ltd., 32, Millbank, London, S.W.1.

Voltage Regulators for Capetown

Through C. & H. Langler & Co., Ltd., their South African agents, Brentford Transformers, Ltd., last year received an order for voltage regulating equipment for the Capetown Electricity Department and shipment is now under way. The order was for thirty-four units of 300, 500 and 750 kVA which will be installed in the Capetown network for controlling an incoming supply at 11,660 V transformed down to 391 V, with a range of −6 per cent to +15 per cent. The units are designed for automatic control by relay and overcompounding circuit.



Some of the Brentford voltage regulators for Capetown

This is the third order for such equipment received from Capetown. The accompanying picture shows four of the 500 kVA units at the company's works, awaiting shipment.

Engineers' Appointments Bureau

The address of the Professional Engineers' Appointments Bureau is now 39, Victoria Street, London, S.W.1. The telephone number remains unchanged (Abbey 1737).

Plant in a Jamaican Hotel

The Arawak Hotel, a new 176-roomed hotel which has recently been opened on Jamaica's northern coast, relies for its power supply on generators made by the Brush Group, a member of the Hawker Siddeley group. The hotel is air-conditioned throughout, and the lighting arrangements, several lifts, extensive kitchen facilities and other services make up a total electrical load of approximately 1,000 kW.

The generating plant consists of three National R4AU8 diesel engines, directly coupled to three Brush 500 kW alternators. Each set is mounted on a combined bed plate and is fitted with anti-vibration mountings so that no vibrations should be transmitted beyond the power station building, which is separate from the hotel. To deaden the exhaust noise, two silencers have been fitted to each of the three engines. A multi-panel Brush switchboard controls the generating sets and the power is fed to a substation in the hotel by underground cable.

Electric Melting Techniques

New ideas in electric melting are to be shown to industry at an exhibition to be held by Birlec, Ltd., in conjunction with the London Electricity Board, at the Board's premises in Nelson Street, East Ham, from 10th to 21st March. The principal exhibits will be the new Birlec-Morgan electric diecasting furnace, the latest type of Birlec Tama tilting furnace and the Birlec "Ajaxomatic" holding and pouring unit for aluminium diecasting, operating under production conditions with a Herbert - Reed - Prentice 1½ G diecaster. Also on show will be a scale model of the latest Birlec Detroit rocking arc electric melting furnace. Admission to the exhibition is by invitation, which can be readily obtained from the Publicity Department, Birlec, Ltd., Tyburn Road, Erdington, Birmingham.

Catterick Camp Modernisation

A contract has been awarded to Crompton Parkinson, Ltd., for a new distribution system at Catterick Camp. Twenty-five substations will be provided, housing thirty-four UD4M2 indoor 11 kV oil circuit-breakers and forty UID 11 kV fault-making oil switches. Twenty-five 11 kV/433 V transformers with ratings from 50 kVA to 500 kVA are to be supplied together with one 300 kVA, 11 kV/3,450 V transformer. The contract also includes the installation of over 10,000 yd of 3/·145 hard drawn copper cable for use on the 11 kV, 3-phase overhead lines, and the erection of the necessary poles, etc., to carry the lines. Approximately 27,000 yd of trenching will carry the three-core 11 kV, p.l.s.w.s. cable and for interconnection purposes 4,000 yd of l.v. cable will be supplied. The completed project will cost approximately £100,000, including the preparation work, removal of the existing 3,450 V system and the installation of the new equipment.

Large Polish Order for Met.-Vick

What is said to be the largest single order placed in this country by Poland since the war (valued at £2½ million) has been awarded to the Metropolitan-Vickers Electrical Co., Ltd. It is for two 120 MW steam turbo-alternators and was placed by "Elektrim" (the official Polish organisation dealing with the import and export of electrical equipment) with the agreement of the Board of Trade. The two turbines, which are the largest ever ordered from this country for use in Europe, will be delivered in 1961.

These reheat sets will have three-cylinder turbines running at 3,000 r.p.m. with steam conditions of 1,800 p.s.i.g. 1,000/1,000 deg F. The turbines will be directly coupled to generators rated at 120 MW, 0·8 p.f., 13·8 kV, three-phase, 50 c/s, which will be cooled by hydrogen at a pressure of 30 p.s.i.g.

Fluorescent Tube Guide

An article on "The Fluorescent Tube Guide," by W. A. R. Stoyle and A. G. Brown, which was published in the December issue of *Light and Lighting*, is now available in booklet form from 32, Victoria Street, London, S.W.1, price 2s 4d including postage.

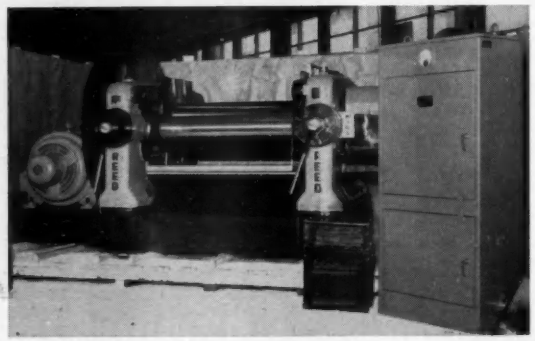
Plug Braking for Rubber Mill

A special feature of a rubber mill which has just been exported to the United States by Reed Brothers (Engineering), Ltd., Replant Works, S.E.18, is the use of electrical plug braking operated by the safety interlock.

The mill consists basically of two horizontal, cast iron rollers driven by a 150 h.p. Brook slip-ring motor. A batch of rubber is continually passed through the rollers until it is properly mixed and of the right consistency.

A sensitive safety bar is fitted to the front of the machine and a ½in movement of the bar causes the application of the brake. If the operator's hand becomes stuck in the hot mass of rubber being milled, he is drawn

Reed Brothers rubber mill for export to the United States



forward into the machine and it is essential that some form of quick braking shall be provided.

The plug braking equipment (made by Allen West & Co., Ltd.) employed on this machine has many advantages over the more usual electromagnetic brake. It is not dependent on any mechanical devices and it is not necessary to stop the machine rapidly on all occasions (a feature of the continuously rated electro-mechanical braking system). This reduces shock loading and wear on the motor and transmission. Inching in reverse is possible at all times independent of the position of the safety bar. Thus, if a man is trapped, he can be removed quickly or if the machine stalls on overload, the wedge of rubber causing the overload can be removed by inching in reverse.

An additional advantage of the Allen West plug braking system is that if the braking becomes defective for any reason, mechanical or electrical, then the machine halts and cannot be restarted until the fault is rectified.

The 150 h.p., 550 V, three-phase 60 c/s, 1,200 r.p.m. Brook motor is built to withstand plug braking and is continuously rated in accordance with B.S. 168 : 1936.

Wholesalers' Exhibition

On Monday and Tuesday last E. Wilkes (Electrical Factors), Ltd., of Bradford, arranged an exhibition of industrial equipment at the Griffin Hotel, Leeds. The products shown included industrial trunking and the "Atlantic" range of Atlas Lighting, Ltd.; slotted angle and tools by Dexion, Ltd.; switchboards, switchgear and miniature circuit-breakers by Dorman & Smith, Ltd., cable glands by Hawke Cable Glands, Ltd.; and mineral-insulated cables by Pyrotenax, Ltd.

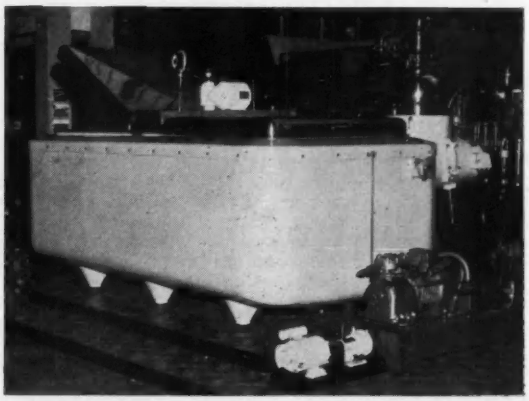
Sink Refuse Grinders

Local authorities are making an approach to Mr. Derek Walker-Smith, the Minister of Health, for power to control the use of electric sink refuse grinders.

This follows a report from the Law Committee of the Association of Municipal Corporations, which says its attention has been drawn to the increasing use of this type of appliance both in domestic and business premises. The Committee refers to the "possible problem which such use will create for sewage disposal authorities."

Engineering Work for Girls

A new illustrated booklet in the Central Youth Employment Executive's "Choice of Careers" series, "Engineering Work for Girls," was published on Monday last (No. 77, H.M. Stationery Office, 1s 3d). This states that the experience of two world wars has shown that girls can do many engineering jobs, and on some jobs are even better than men. About one-fifth of all engineering workers are women and girls—over half a million in all the branches of the industry, though mainly in light engineering. Separate sections of the booklet describe jobs in making component parts, assembly work, and testing and inspection — work mainly learned by girls who leave school at 15. One section touches on work for older school-leavers, including training or apprenticeship for the skilled crafts, work in laboratories and drawing offices, and other more advanced work in research and design.



A 350 gal electrically refrigerated "Desco" farm milk tank which was shown at the recent Scottish Dairy Show in Glasgow

Maintenance Workers' Grading

About 200 maintenance men employed at four Tyneside power stations staged a one-day token strike on 24th February. The men involved are members of the Electrical Trades Union and the Amalgamated Engineering Union. The unions stated that the electricity authority had refused "point blank" to consider representations for the regrading of craftsmen's duties which would have meant higher wages for maintenance staff fitters and similar workers in power stations.

Board of Trade and Overseas Fairs

The Board of Trade has issued a list of overseas trade fairs in which it will stage its own displays, in association with the Council of Industrial Design or the United Kingdom Atomic Energy Authority. The list includes the Brussels International Exhibition (17th April to 19th October), the German Industries Fair, Hanover (27th April to 6th May), and the International Autumn Fair, Vienna (7th to 14th September), at which there will be atomic energy displays.

Trade Announcements

Line Equipment, Ltd., is now able to obtain a new "Epikote" resin bonded fibre glass for its portable operating poles which has much higher mechanical and electrical characteristics and the company will be supplying this material against all future orders. These new operating poles will be labelled "Epifil" and the prices will be considerably reduced.

A showroom has been opened at the factory of **Browning Street Industries, Ltd.,** Browning Street, Birmingham, 16, for displaying the combined products of the company's four subsidiaries—W. T. French & Son, Carpenter & Allen, G. & W. Purser, and Ladbrook Stampings.

New extensions recently made to its factory and office blocks by **Partridge Transformers, Ltd.,** double production space. While no move is contemplated, recent new G.P.O. sorting arrangements in the area require that correspondence should in future be addressed Partridge Transformers, Ltd., Roebuck Road, Chessington (not Tolworth), Surrey.

New sales and service offices for the **Dictaphone Co., Ltd.,** at 33, George Street, Edinburgh, were formally opened by Dr. L. T. M. Gray, president of the Edinburgh Chamber of Commerce, on 14th February. Mr. A. Young is the manager.

Mr. A. W. Kirton has been appointed technical representative in the south west area for **British MonoRail, Ltd.** For the past five years Mr. Kirton has been the south west area representative of the mechanical handling division of Fisher & Ludlow, Ltd.

On and after 1st March the address of the Midlands office of **Wild-Barfield Electric Furnaces, Ltd.,** will be 71, Broad Street, Birmingham, 15 (telephone: Midland 7232).

Atlas Lighting, Ltd., and **Ekco-Ensign Electric, Ltd.,** announce that the British Standards Institution has granted the first licence to use the mark of the Institution on "Atlas" and "Ekco" choke ballasts for the operation of 5ft 80 W fluorescent tubes. The materials and components used in the manufacture of the ballasts comply with the requirements of B.S. 2818 and the quality control methods exercised ensure that the whole production of 80 W chokes covered by the licence meet the requirements of B.S. 2818.

Mr. L. G. Milsom has joined **J. Langham Thompson, Ltd.,** as chief technical representative of the sheet metal division, and he will be responsible for sales of the datum range of instrument racks and cases.

Modern Lighting

SOME EXAMPLES OF RECENT INSTALLATIONS

THE variety in lighting fittings and in their design and layout are infinite, each individual installation calling for special planning to meet the purpose for which it is to be used and, in many cases, to harmonise with the architectural design of the premises. From numerous examples which we have received, we illustrate on the opposite page some recent installations.

A good example of well-planned modern lighting for laundries and dry-cleaning plant is that at the premises of the Greenhill Laundry Co., Ltd., Harrow. For this, Crompton Parkinson, Ltd., have supplied 110 AO11 "New-Range" fluorescent lighting fittings with "Permawhite" fully "Bonderised" finish, each housing a single 80 W 5ft tube. These fittings are mounted at a height of 10ft above twin rapid presses to provide an ample localised lighting intensity of 22 ft-candles. Similar Crompton fittings are mounted at a height of 10ft over the calender ironer to provide a localised intensity of 25 ft-candles. Vapour-proof vitreous enamel fluorescent fittings (AV1113) were selected for installation in the wash-room, because of their resistance to corrosive fumes and steam in the atmosphere. These are mounted at a height of 10ft to provide an average general illumination of 14 ft-candles. Throughout the installation Crompton 80 W "Daylight" fluorescent tubes are used.

Instrument Factory Installation

An "Atlas" lighting installation with a difference is now in operation at the Kelvin & Hughes instrument factory at Barkingside, Essex. In the laboratory, where aeronautical compasses are tested, it was essential that the structure of the building should be completely non-magnetic. The entire frame of the building is, therefore, of aluminium, and where wooden battens were necessary nails and screws were eliminated in favour of glue. The lighting problem was overcome by using lengths of special aluminium trunking supported on non-magnetic brass rods, the fluorescent control gear being housed in a box at one end of the building so that its magnetic field was well clear of the delicate instruments being tested. Twenty special twin tube 5ft 80 W fittings with "Perspex" trough reflectors are used and an unusual feature is that the starter switches are situated within the trunking—a device which halves the amount of wiring required with remote control gear. Light level obtained is approximately 40 lumens/sq ft. The installation was carried out by Atlas Lighting, Ltd.

An unusual combination lighting arrangement has been installed in the entrance hall of the Theatre Royal, the Glasgow studios of Scottish Television, Ltd. Contrasting with the date 1868 in the mosaic floor of the hall—the date the original theatre was built—the modern lighting layout combines five panels of "Lumenated" ceiling, totalling 325 sq ft, and a number of traditional lighting fittings. Each of the panels is illuminated by three G.E.C. 5ft 80 W fluorescent tubes installed in the 18in plenum. Four solid panels of equal area complete the false ceiling, and these each bear a cluster of lamps in a contemporary holder. The lighting scheme was designed jointly by the General Electric Co., Ltd. (Glasgow), and the architects, Burnet & Boston (Glasgow). The consulting engineers were D. Smith, Seymour & Rooley. The "Lumenated" ceiling was supplied by Lumenated Ceilings, Ltd., and erected by Dick & Benzies, Ltd.

Pleasing form and radiant colour are the highlights of a new installation carried out recently at St. Joseph's Hospice, Mare Street, Hackney, for the Sisters of Charity, and under the direction of the architects, Stewart & Hendry. Breaking away from traditional treatment, highly decorative contemporary fittings have been widely employed. In the wards cherry-red, blue grey and primrose-yellow reflectors blend with the general decoration, providing a great improvement on the subdued effect usually associated with hospitals. Modern suspended five-light fittings give the entrance hall a cheerful appearance. In the corridors there are attractive etched glass fittings, incorporating night lighting. All the fittings used were manufactured by Falk, Stadelmann & Co., Ltd. The electrical installation was carried out by Troughton & Young, Ltd.

At "The White Knight," Crawley (Improved Public House Co., Ltd.), the company has taken advantage of the flexibility of the "Harlequin" range, to use parts of these fittings with reflectors from the "Mondolite" range of Troughton & Young, Ltd., to produce an unusual lighting scheme for the interior of the saloon bar. F.897 reflectors have been hung at varying heights from the "Harlequin" three-light suspension, three such fittings providing the general lighting for the lounge. Lighting over the bar is obtained by semi-recessed fittings, type F.1205.

The lighting fittings installed in the Town Hall, Shoreditch, were made by Ekco-Ensign Electric, Ltd., whose illuminating engineers co-operated with Mr. J. L. Sharratt, borough engineer and surveyor, and the electrical contractors, Holmes & Larkinson, in the design and planning of the installation. A total of 10 vertical pendant fittings were installed, each comprising five 80 W 5ft fluorescent lamps with a 300 W tungsten lamp in the base. Their mounting height above the floor level is 30ft.

The new memorial building of the Trades Union Congress in Great Russell Street, London, comprises offices, conference hall, Council suite and rooms, training college and war memorial. From the lighting point of view, Mr. D. du R. Aberdeen, who designed the building, has incorporated a variety of interesting features. For many of these he has drawn upon a varied range of standard prismatic fittings supplied by Holophane, Ltd., including the prismatic fittings recessed into the ceiling of the main entrance hall. The electrical consultants were G. H. Buckle & Partners and the electrical contractors were Rashleigh, Phipps & Co., Ltd.

Retail Shop Lighting

A new "Mazda" shop lighting scheme (A.E.I. Lamp & Lighting Co., Ltd.) has recently been installed in Messrs. Mitchell's butchers' shop in Mercer Street, Northampton. The scheme consists of recessed fluorescent and tungsten lighting in a suspended ceiling using ceiling tiles and lighting equipment. The main lighting is by 16 fluorescent lamps—eight 5ft 80 W and eight 4ft 40 W—above three 12ft high, 25ft by 3ft "Lumenated" panels. "Mazda" de-luxe warm white fluorescent instant start lamps have been used of the type with an external water repellent silicone coating. Sixteen additional 150 W tungsten lamps are used, twelve in recessed fittings in the Burgess ceiling tiles and four reflector spotlights in "Cupola" swivel fittings. The electrical contractors were F. Mitton & Son, Ltd., Northampton.

The "Self Service" shop recently opened by Bishop's Stores at 484, Church Road, Northolt, is illuminated by continuous runs of "Multi" twin 80 W fittings with "Perspex" diffusers, made by the Major Equipment Co., Ltd.

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1. Theatre Royal, Glasgow (General Electric Co., Ltd., and Lumenated Ceilings, Ltd.). 2. Kelvin & Hughes Works, Barkingside (Atlas Lighting, Ltd.). 3. Greenhill Laundry Co., Harrow (Crompton Parkinson, Ltd.). 4. T.U.C. Memorial Building, London (Holophane, Ltd.). 5. St. Joseph's Hospice, Hackney (Falk, Stadelmann & Co., Ltd.). 6. "The White Knight," Crawley (Troughton & Young, Ltd.). 7. Mitchell's butchers' shop, Northampton (A.E.I. Lamp & Lighting Co., Ltd.). 8. Bishop's Stores, Northolt (Major Equipment Co., Ltd.). 9. Town Hall, Shoreditch (Ekco-Ensign, Ltd.).

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GENERATION AND DEVELOPMENT

Area Board Sales

The accompanying table analyses the electricity sales by the Area Boards in January. The national figures show an increase over January, 1957, of 12·4 per cent, but, when corrected for weather conditions and working days, the increase is 9·4 per cent.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for January (million kWh)			Twelve Months Totals Ended 31st January (million kWh)		
	1957	1958	Inc. or Dec. %	1957	1958	Inc. or Dec. %
London	775·0	864·8	+11·6	7,063·4	7,208·1	+ 2·0
South Eastern	473·9	548·9	+15·8	4,530·5	4,685·0	+ 3·4
Southern	587·0	693·1	+18·1	5,493·2	5,899·1	+ 7·4
South Western	283·2	312·2	+10·2	2,782·3	2,904·9	+ 4·4
Eastern	757·2	877·3	+15·9	7,200·9	7,592·3	+ 5·4
East Midlands*	625·2	698·9	+11·8	6,104·2	6,424·6	+ 5·2
Midlands*	816·7	919·5	+12·6	7,833·7	8,239·2	+ 5·2
South Wales*	446·6	467·4	+ 4·7	4,549·2	4,835·0	+ 6·3
Merseyside and N. Wales*	476·9	526·2	+10·3	4,776·1	5,037·4	+ 5·5
Yorkshire*	813·4	902·2	+10·9	7,918·3	8,367·8	+ 5·7
North Eastern*	448·9	509·9	+13·6	4,556·7	4,851·2	+ 6·5
North Western*	844·8	923·3	+ 9·3	8,322·2	8,607·1	+ 3·4
Total all Area Boards	7,348·8	8,243·7	+12·2	71,130·7	74,651·7	+ 5·0
Direct Supplies by C.E.G.B.	205·6	245·4	+19·4	2,215·9	2,488·7	+12·3
Grand Total	7,554·4	8,489·1	+12·4	73,346·6	77,140·4	+ 5·2
Mainly Industrial Areas*	4,472·5	4,947·4	+10·6	44,060·4	46,362·3	+ 5·2
Mainly Non-Industrial Areas	2,876·3	3,296·3	+14·6	27,070·3	28,289·4	+ 4·5

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

Trade Unionists Support Nuclear Scheme

The establishment of a nuclear power station at Crimond, Aberdeenshire, is urged in two resolutions put forward for the Scottish Trades Union Congress at Aberdeen in April. The sponsors of the resolutions are the Aberdeen Trades Council and the Amalgamated Engineering Union. Alarmed at the high rate of unemployment in the north-east of Scotland, Aberdeen Trades Council states in its resolution: "The proposition to establish a nuclear power station at Crimond could, if implemented, make a considerable contribution towards improving the position."

Proposed Richborough Power Station

Speaking at the annual meeting of Sandwich Chamber of Commerce recently, Mr. W. B. Shannon, chief generating engineer (construction), London Division, Central Electricity Generating Board, said that this summer between 50 and 100 men might be working on the first stage of construction of the power station it was planned to build at Richborough. By 1961 there might be 1,000 workers employed on the site, and many of them would be drawn from local labour sources. Exploratory work being carried out on the site at the present time, he said, would determine the type of foundation needed, and it was hoped to begin the first work—putting in roads—by July this year.

The station was estimated to cost £20 million and was scheduled to come into operation in 1962. A second plant would be installed in 1963-64 and the Board hoped that a third, not yet sanctioned, would be installed in 1965. Kent coal, from Tilmanstone, Betteshanger and Snowdown Collieries, would be burned, and an electric railway line was to be laid to connect with the station. About eight million gallons of water a day might be taken from the River Stour.

The station would probably be the last of its type in that part of the country.

OVERSEAS

Further Tenders for Snowy Scheme

It is reported from Canberra that tenders have been received from Australia, Great Britain, the United States, Canada and Japan for the next stage of the Snowy Mountains hydro-electric scheme. The work involved includes the building of two dams, 225 and 150ft high; two 10-mile tunnels through the mountains; and a 280 MW underground power station.

New Cape Town Power Station

On the outskirts of Langa and Athlone, where wattle and sand have remained undisturbed for scores of years, modern machinery is now preparing the foundations for Cape Town's new £12 million power station. The site is near the city's sewage disposal works, the effluent from which will be used, in conjunction with cooling towers, for the water circulation system. The existing Table Bay and Salt River power stations use sea water for this purpose. The new station is being built in two stages on foundations of reinforced concrete piles. Present contracts are for the first stage of the building designed to take three turbo-alternators and four boilers. It is hoped to have the first set in commission by the winter of 1960. Ultimately the station will be extended to take six turbo-alternators and eight boilers.

Power for Canadian Mines

The Ontario Hydro-Electric Power Commission has announced that it is to build two generating stations in Northern Ontario at a cost of $50 million to increase power supplies to the mining industry. They will be at Red Rock, on the Mississagi River, and Otter Rapids, on the Abitibi River. The chairman of the Commission, Mr. J. S. Duncan, said that the development of the sites would help immeasurably to safeguard and improve the supply of power to Ontario's important mining industries, especially the world's major uranium centre at Blind River.

The Red Rock station, expected to be completed by 1960, will have a capacity of 31 MW and the Otter Rapids station, planned for completion by 1961, 131 MW.

Kariba Setback

The Salisbury (Southern Rhodesia) correspondent of *The Times* reports that work on the main wall of the dam for the £80 million Kariba hydro-electric project has been held up by the flooding of the circular coffer dam, which developed a leak. A pump man managed to escape as water gradually filled the coffer dam, flooding all the equipment inside.

Mr. Duncan Anderson, chairman of the Federal Power Board, said the flooding was not expected to affect the completion date of the main dam. He hoped the time lost would be made up by the end of the year.

Full Demand Met in Mauritius

The general manager of the Central Electricity Board of Mauritius (Mr. A. N. Bott, M.I.E.E.) has sent us a copy of the Board's fourth annual report and accounts covering the calendar year 1956. With the taking over of the General Electric Supply Co.'s system, the Board has become responsible for an island-wide undertaking.

In a review of the Board's activities, Mr. A. J. Borland, C.B.E., chairman, says that the year may be regarded as marking the end of the emergency period. Further plant has been installed at the St. Louis station and the electricity supply should now be assured, given freedom from abnormal droughts or serious breakdowns. A

severe drought was, in fact, experienced during the year, but the Board was able to meet the demand in full although the higher cost of thermal power (12·96 cents/kWh against 2·96 cents for hydro-electric energy) was a financial embarrassment.

A total of 41·2 million kWh was generated, of which 26·7 million kWh was produced at the Tamarind Falls, Reduit and Cascade Cecil hydro-electric stations. The previous year's output was 36·8 million kWh. Average annual consumption rose from 894 to 931 kWh per consumer, of whom there were 36,237 at the end of the year. Two further hydro-electric projects were approved, at Magenta and La Ferme.

The possibility of persuading the sugar factories to sell their surplus energy to the Board is being investigated. The report points out that as the cane crushing season coincides with the yearly dry period, such an agreement should help to reduce the Board's generating costs. Various methods of power generation are being studied, including nuclear, hydro, sea wave, thermal and wind.

The accounts show a trading profit of Rs.557,712 (against Rs.815,073). After meeting interest charges, etc., the net result was a loss of Rs.899,688, making the accumulated deficit since 1953 Rs.1,818,953. The main reasons are stated to be the unremunerative development programme, heavy expenditure on thermal generation, and the upward trend of prices and shipping costs. (Rupee = 1s 6d.)

Finance for Volta River Scheme

In the Ghana National Assembly last week the Prime Minister (Dr. Nkrumah) said that he had been in personal touch with President Eisenhower, asking him for aid in financing the Volta River hydro-electric scheme. Dr. Nkrumah said that a "vicious circle" had arisen in this connection. Interested Governments had stipulated that the Ghana Government should first come to an agreement with the aluminium interests, while the latter wanted assurances about the cost of power. Added to this difficulty was the high rate of interest on any sterling loan. President Eisenhower had offered the good offices of the United States Government in examining the position and in the meantime the Ghana Government would seek further discussions with Aluminium, Ltd., which held bauxite concessions in the Yenahin area.

The plans for the development of the Volta River envisage a power station with a capacity of 600 MW; the latest estimate of the cost was about £300 million.

Underground Atomic Station

An agreement on collaboration in building the reactor for the Swedish State Power Board's first large atomic power station has been signed between AB Atomenergi, Asea, and Nydqvist & Holm AB. As a first step, Atomenergi and the industrial companies concerned will form a work group to study the types of reactor suitable for this plant.

The R 4/Eve plant is scheduled for completion by 1964. It is to be built underground and the hilly country by Lake Unden near Finnerödja, in the western part of Central Sweden, has been mentioned as a probable site.

Installation of St. Lawrence Generators

Three years after construction started, the first generators are now being installed at the Ontario Hydro-Electric Power Commission's section of the St. Lawrence project and four will be ready by July, when generation is scheduled to commence. Reporting this, *Electrical News and Engineering* (Canada) says that an interesting feature of the installation is the suspension of the entire turbo-generator unit on a main thrust bearing, the bearing being designed to take the total weight of the generator, exciter, turbine runner, shaft and water, amounting to some 1,400 tons. Air and water cooling will be used for all the generators and the six-storey administration building at the end of the dam will be heated by using the warmed cooling water which flows into the heat pump. Instead of the conventional building to house the generators there will simply be steel covers over each unit; these covers will slide apart on tracks to expose the generators.

Persian Contract for Italian Firm

The Development and Resources Corporation of New York announces that a contract to build an electric power transmission line in the Khuzistan region of south-west Persia has been awarded to the Societa Elettrificazione, Milan. The line, to be completed by January, 1959, will link Abadan, on the Persian Gulf, with Ahwaz, the chief town of Khuzistan, states the New York correspondent of *The Times*.

The line is to supply the Ahwaz area with electricity from the Abadan steam generating plant pending the completion of a major hydro-electric project on the Dez river, north of Ahwaz. The Dez dam, planned by the same Corporation, will also supply Persian Gulf cities, using the new transmission line. Its ultimate power capacity will be 520 MW and it is expected that about 130 MW will be available in 1962. The capacity of the reservoir will be sufficient, it is stated, to irrigate 375,000 acres of land in the Khuzistan plain.

The Abadan-Ahwaz line is expected to cost about £714,000. Transformers for the project are to be made by Hitachi, of Tokyo, whose tender of £116,000 was the lowest of twelve received last November.

District Heating in Hungary

According to a report in the Hungarian newspaper *Esti Hirlap*, two thermal power stations are to be built in Budapest to produce 60 million kWh a year for the national grid and steam to heat flats and factories nearby, thus saving about 200,000 tons of coal a year. By the end of 1960 Budapest power stations will be heating a total of 3,000 homes with steam. A new mile-long pipe line went into service this winter which provides heating for 600 flats at half the cost of normal central heating. Networks for steam heating are also to be built in the provincial towns of Debrecen, Pécs, Miskolc and Györ.

Integration in Guatemala

The *Fortnightly Review* of the Bank of London and South America reports that, pending the formation of a national power authority, the President of Guatemala has formed a commission to draw up an integrated plan for the development of electrical energy in the Republic. The present shortage of electric power in the country is expected to become serious in the future and the commission is to study plans for new installations and methods of financing their construction.

The first of two 200 MVA 18/140 kV three-phase 60 c/s transformers for the City of Los Angeles leaving the Stafford Works of the English Electric Co., Ltd.

NEW ELECTRICAL EQUIPMENT

Industrial Photo-Cell

A comprehensive range of a new type of photo-electric cell, which will enable the cost of many industrial control and detection devices to be reduced substantially, will be available from MULLARD, LTD., Mullard House, Torrington Place, London, W.C.1, in a few weeks. The photo-sensitive element of cadmium sulphide is said to be some 20,000 times more sensitive than the conventional photo-emissive cell. Even from weak sources of light, it will produce sufficient current to operate a large relay direct, without the need for intermediate amplification.

Furthermore, the cell will produce the current necessary to operate a relay with only a very low applied voltage. This is made possible by a special form of construction in which the resistance of the cadmium sulphide element is effectively reduced by an interdigital pattern of copper strips. The cadmium sulphide cell can replace the conventional photo-emissive cells in the majority of devices designed to perform on-off switching operations at speeds up to about 50 c/s. Its inherent ruggedness makes it particularly suitable for industrial use, and being non-polar it will operate from both a.c. and d.c. supplies.

Spot Welder

To meet the demand for a spot welding machine with completely automatic control of both welding time and "hold down" or forging time, a range of Meritus bench type spot welding machines of 5 kVA, 6 kVA and 8 kVA has been designed. These machines are made by MERITUS (BARNET), LTD., Wood Street, Barnet, Herts., and are fitted with the company's patented "Autoforge" interlocking mechanism.

Non-Metallic Electric Kettle

A new non-metallic electric kettle, the Fordham Geeco "Pollyput," has just been placed on the market by G. & E. EQUIPMENT & CONTRACTS, LTD., Gore Road Works, New Milton, Hants. Claimed to be the first of its kind, it is manufactured from a new rigid polythene, is shockproof, and cannot be dented or damaged, even if dropped. Its heat retaining qualities are said to be good. Lime does not adhere to the inside, thus "furring" is kept to the minimum.

The kettle, of 4 pt capacity, has a 1½ kW element and is available in a wide range of attractive two-tone colours—white with red, blue, green or primrose. It is light and easy to handle and is fitted with push-button lid control with whistle. The kettle is guaranteed for twelve months and costs £3 plus 13s purchase tax in the United Kingdom.

Mobile Radiotelephone

The latest addition to the "Ranger" two-way radiotelephone series of PYE TELECOMMUNICATIONS, LTD., Newmarket Road, Cambridge, is a heavy duty equipment which offers a very long working range, has transmitter output powers of up to 15 W with amplitude modulation and 20 W with frequency modulation and is designed to fit neatly and unobtrusively into any vehicle. The main unit can be installed in the boot of a car or similar out-of-the-way place, leaving only the control unit, which contains the loudspeaker and simple operating controls, to be mounted on the dashboard or in any other convenient position.

The equipment is produced in 5 and 15 W a.m. and 10 and 20 W f.m. versions. The a.m. equipment will operate on channel spacing from 20 to 100 kc/s and the f.m. equipment on 50 kc/s. All equipment will operate on single or double frequency simplex, or duplex on fixed frequencies in the band from 25 Mc/s to 174 Mc/s, and models with up to six switch-selected channels are available. A feature of "Ranger" equipment is the ease of accessibility. It is suitable for use in all climates.

Injection Moulding Machine

The "S.R.S." hand operated bench injection moulding machine for use with all thermoplastic materials is suitable for the rapid production of integrally moulded plugs, wire joints and other electrical components. It is manufactured by S. R. SEYMOUR & CO., LTD., Brook Road, Rayleigh, Essex.

A single movement of a vice lever opens the mould and ejects the moulding, making possible, it is claimed, up to 400 shots an hour with minimum manual effort. Vertical and horizontal adjustment accommodates a wide variety of sizes of moulds. The price of the machine is £130.

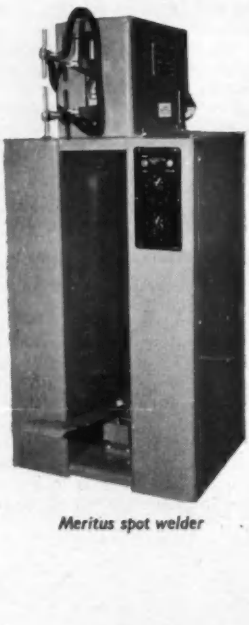
Neon Signal Lamp

A new neon signal lamp (type SL78) has recently been produced by ARCOLECTRIC (SWITCHES), LTD., Central Avenue, West Molesey, Surrey. It has a single ⅛in hole fixing and its built-in ¼ W neon tube and resistor are claimed to have a life of many thousands of hours. A rubber moisture seal is fitted at the point where the flexible p.v.c. leads enter. The lead measures 8in in length and other lengths up to 15in may be ordered. A screw-on lens is also provided and this may be either red, amber or clear. Models are available for all voltages between 80 and 600 V and the list price is 5s 6d.

Solenoid Valve

A solenoid operated fluid power control valve which can be actuated when the electrical supply is not available has been introduced by the BALDWIN INSTRUMENT CO., LTD. The valve can be manually operated by simply pushing a large knob with the palm of the hand.

The operation is by means of a shaft which enters through the end cover of the valve and makes contact with the pilot piston head which in turn is connected to the spool. When the over-ride shaft is depressed, it moves the spool from the "normal" to the "operated" position. The



Meritus spot welder

Pye "Ranger" mobile radiotelephone

Mullard cadmium sulphide photo-cell

Arcolectric neon signal lamp

Baldwin solenoid valve

spool can be locked into the operated position by rotating the over-ride shaft when it is fully depressed. At present, the over-ride feature is available as standard on ¼in and ½in bore control valves only.

pH Meter Test Set

A test set to enable laboratory and industrial pH meters to be checked quickly is announced by A. M. LOCK & CO., LTD., 79, Union Street, Oldham, Lancashire. The instrument engineer can check a complete pH measuring, recording and control installation easily, without having to put the electrodes into a number of buffer solutions. The test set consists of a dry cell across which is connected a number of high stability resistors forming a potentiometer. These resistors are connected to a multi-position switch which selects an increasing number of millivolts as it is rotated in a clockwise direction, each step approximating to 2 pH units. The pH meter test set is priced at £12 10s complete with all inter-connecting leads.

Compression Terminals

A wide range of compression terminals, and tools, has recently been placed on the market by HELLERMANN, LTD., Crawley, Sussex. The terminals are designed for use wherever small cables are to be installed and are available in a number of shapes and sizes in two styles, the "Twingrip," which as well as gripping the conductor provides an installation support, and the "Wiregrip," which grips the conductor only. They are supplied uninsulated, but insulation may be added by a Hellermann sleeve.

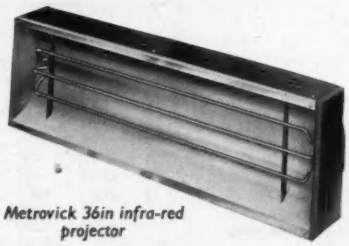
The Mark III hand compression tool is light and well balanced and used with the compression terminals is claimed to produce an electrical joint of very low resistance and high mechanical strength, even in unskilled hands.

Infra-red Projector

An improved model of the company's standard infra-red projector with tubular metal-sheathed heating elements has been introduced by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17.

Designed for general infra-red heating applications such as paint stoving, moisture extraction and preheating, the projectors can be fitted end-to-end to form continuous troughs, assembled

Lock pH meter test set



Metrovick 36in infra-red projector

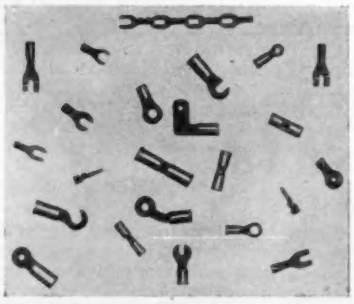
in banks, or used in angular formation to accommodate products of irregular shape. They can also be built into an enclosed plant, or used as portable units on stands. The end and back covers can be dispensed with where close spacing is desirable such as in enclosed ovens. These covers in the new model are robust steel pressings with ventilation louvres instead of perforations.

Methods of supporting the projectors have been simplified, and pressed steel brackets, readily clipped into slots, enable the units to be attached to 1in diameter conduit or bar. Alternatively, the slots can be used to bolt the projectors to angle or slotted angle. Conduit entry is catered for by a new type of fixing plate enabling the conduit to be attached by means of lock-nuts.

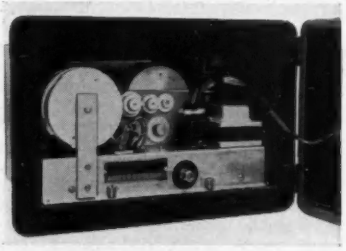
The reflector and metal-sheathed element remain unchanged, apart from an improved method of supporting the element in the reflector. Terminal arrangement has been improved by the use of nickel-plated steel bars in place of copper rod, and a simple arrangement allows the projector to be converted for use on d.c. or single- or three-phase a.c. supplies. They are available in 18, 24 and 36in lengths in loadings from 1·5 kW to 4 kW. The prices range from £12 15s to £15 4s 6d according to size.

Controller Safety Unit

A unit made by the FOSTER INSTRUMENT CO., LTD., Letchworth, Hertfordshire, provides a mechanism that automatically and periodically checks the functioning of potentiometric self-balancing temperature controllers. The unit sends a periodic test signal through the signal generating, measuring and balancing system which, if it fails to get through due to any electrical or mechanical fault in the system,



Selection from the Hellermann range of compression terminals



Foster controller safety unit

causes a warning signal to be given and, if required, automatic shut-down or safeguarding action to be taken.

The frequency and strength of the test signal can be set to suit the "runaway" time of the controlled process and the balancing speed of the controller. The device is fitted with an alarm which functions should its own prime mover fail.

Cable Spinner

A spinner for overhead catenary-supported cables up to 1in diameter has been developed by PIRELLI-GENERAL CABLE WORKS, LTD., 343-345, Euston Road, London, N.W.1, specifically for applications where portability and easy manipulation are of major importance. The spinner consists of a rotating drum on which is mounted the spool of wire for lashing the cable to the catenary. Two feet on the drum act as a counterbalance to the spool when it rotates and also form a support for the spinner when on the ground.

To prepare the spinner for use, the catenary and cable are threaded through the drum and the spool of lashing wire is placed in position. The wire is then passed round a friction wheel attached to the drum and bearing against the end-plate of the spinner, and is clamped to the catenary between fixed and adjustable rollers. When the catenary is in position between the supports of the span, the spinner is towed along it by hand. As the lashing wire is paid out from the spool, it causes the friction wheel to rotate so that it travels round the circumference of the end-plate and turns the drum, carrying the wire round the cable and the catenary in a spiral as the spinner moves forward along the span.

Financial Section

STOCKS and SHARES

IN the Stock Exchange there has been no change of direction in the investment trend, which continues to incline more favourably towards Government securities, industrial debenture and loan stocks, than to ordinary shares. Wall Street has continued to exercise its uncertain influence on the latter. In the sphere of company news, the electrical market awaits its next big event in the appearance of A.E.I.'s results for 1957, and has been impressed meanwhile by English Electric's report of an increase in the group's order book to £250 million, which is £70 million above the level of a year ago.

Price Changes

Irregular movements affected electrical share prices during the past week, with minor losses predominating. In the heavy engineering section International Combustion, at 23s 6d, again set a good example, adding a further 1s 6d to the previous week's advance of 2s induced by the annual results and by news of the Thorpe Marsh boiler contract. Clarke Chapman, however, were marked down by 10s, to 125s, after the company's announcement of reduced profits. Babcocks, Richardsons Westgarth, and Head Wrightson all lost ground, and there were recessions in Reyrolle, B.E.T., Hackbridge & Hewittic, Dewhurst, Hackbridge Cable, Wolf Electric and others. On Babcock & Wilcox new 6 per cent debenture the premium expanded to 3½ points, while the premium on Richardsons Westgarth 6 per cent convertible loan stock rose further to 8 points. Taylor Tunnicliff improved well to 12s 9d on the increase in the dividend from 15 to 17½ per cent, from higher earnings.

Cable Shares

Within a few weeks the first of the companies in the group of cable and wire manufacturers will be announcing their final dividends and financial results for 1957. For some time the attitude of investment towards this field of engineering has been cautious. In comparison with the best quotations recorded at times last year, B.I.C.C. shares have come down from 55s to under 40s; W. T. Henley's from 17s to 12s 6d; Telegraph Construction from 31s to 21s 6d; and others in similar proportion. Most of these declines can be attributed to the general trend affecting virtually all home industrial share prices. Partly, however, they reflect concern over the likely effects of the slump in the price of copper. Some guidance to 1957 experiences has become available from interim reports issued during the year.

Progress Reports

In their interim report, issued last November, B.I.C.C. stated that the lower prices ruling for copper were chiefly responsible for a fall in the money value of the group's sales during the first half of 1957, for their physical volume had been well maintained. Smaller profit rates also contributed

Price Changes in

Company or Board	Nom. Value	Middle price 24th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	73½	−½	3	3	4 1 9	80	70
Brit. Elec. 1974/77	100	70		3	3	4 5 9	78½	66
Brit. Elec. 1976/79	100	74	−½	3½	3½	4 14 6	81½	70
Brit. Elec. 1974/79	100	83x.d.		4½	4½	5 2 6	92½	79½
Overseas Electric Supply								
Calcutta Elec.	£1	15/9		6†	6·8†	8 13 0†	19/-	15/-
East African Power	£1	18/6		7	7½	8 2 3	21/-	19/-
Nigerian Elec.	£1	15/6	−1/-	10	10	12 18 0	18/6	16/6
Perak Hydro-Elec.	£1	15/-		10	12½	16 13 3	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	10/-	−6d	17½	17½	8 15 0	12/-	9/9
Aerialite	1/-	5/6		48	51½	9 7 3	6/9	4/9
Allen, W. H.	£1	34/6		10	10	5 16 0	47/3	33/6
Anglo-Portuguese Tel.	£1	20/3	−6d	8	8	7 18 0	27/6	20/6
Aron Elec. Ord.	£1	54/-		15	15	5 11 0	60/-	53/6
Assoc. Elec. Ord.	£1	47/6		15	15	6 6 3	73/-	48/9
Automatic Tel. & El.	£1	60/9		15	17·	5 11 9	75/-	54/6
Babcock & Wilcox	£1	42/-	−1/9	15	13‡	6 3 9	82/6	54/9
Bakelite	10/-	20/-	−6d	16	15	7 10 0	24/6	20/9
Baldwin, H. J.	2/-	3/6		20	20	11 8 6	5/-	3/9
Berry's Electric	5/-	6/-		—	10	8 6 9	6/6	5/6
British Aluminium	£1	43/9	−9d	12	12	5 9 6	71/3	38/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	21/-	−1/-	22½	25	5 19 0	25/-	17/-
B.I. Callender's	£1	39/9	−1/6	12½	12½	6 5 9	55/-	39/6
B.I. Callender's 6% Pref.	£1	20/-		6	6	6 0 0	21/9	19/-
British Tabulating	£1	40/-	−9d	9	10	5 0 0	56/3	37/6
British Thermostat	5/-	22/6	+1/3	25	25	5 11 0	27/6	21/3
British Vac. Cleaner	5/-	5/-		15	10	10 0 0	8/-	5/-
Brook Motors	10/-	35/-		25	25	7 2 9	37/6	30/-
Bulgin, A. F.	1/-	4/9		50	40*	8 8 6	5/6	4/-
Burco Dean	5/-	8/3		20	22½	9 1 9*	9/4	5/10
Cable & Wireless: Ord.	5/-	9/9	−9d	10	10	—	12/6	9/6
4% Loan	100	93½		4	4	4 5 6	92½	89
Chloride El. Storage "A"	£1	58/9	+1/3	17½	17½	5 19 3	68/9	55/9
Clarke Chapman	£1	125/-	−10/-	27½	27½	4 8 0	9	5½
Cole, E. K.	5/-	15/9		17½	17½	5 11 0	23/6	16/6
Cossor, A. C.	5/-	4/9		Nil	2½	2 12 9	7/3	5/-
Crabtree	10/-	25/3		20	20	7 18 6	26/-	23/3
Crompton Parkinson Ord.	5/-	8/6		16	16	6 5 6*	11/9	9/3
De La Rue	5/-	22/9		30	35	7 13 9	24/9	16/3
Decca "A"	4/-	22/6		43¾	43¾	7 15 6	32/3	22/-
Desoutter	5/-	14/3		30	32½	5 14 0*	17/9	13/9
Dewhurst	2/-	7/-	−6d	16½	20	5 14 3	7/9	5/9
Dictograph Tel.	2/-	5/3		20	20*	7 12 6	6/3	5/3
Dubilier Condenser	1/-	3/3		30	30	—	5/3	3/-
Duport	5/-	8/3		25	25	7 11 6*	10/6	8/6
E.M.I.	10/-	28/6	−6d	15	15	5 5 3	36/-	23/9
Electrical Components	5/-	7/6		25	12½*	8 6 9	8/-	6/6
Elec. Construction	£1	21/3		8½	8½	8 0 0	27/6	21/9
Elliott-Automation	5/-	12/3		—	10‡	4 1 9	12/6	10/3
Enfield Cable Ord.	£1	11/6		Nil	Nil	Nil	21/6	12/3
English Electric	£1	46/3		14	14	6 1 0	65/-	47/6
English Electric 3½% Pref.	£1	12/3		3½	3½	6 2 6	14/3	11/3
Ericsson Tel.	5/-	18/-	−6d	20†	22†	3 1 0*†	25/-	17/-
Ever Ready	5/-	14/3		35	37½	6 11 6*	20/-	14/-
Falk Stadelmann	£1	37/-		17½	17½	9 9 3	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

to the decline in the trading surplus to £3·9 million, from £4·3 million in the preceding six months, and from £5·2 million in the corresponding half of 1956. In the Johnson & Phillips November progress report, the adverse effects of low copper prices and narrow margins of profit were also mentioned as main factors in the company's decision to pay no interim dividend. Both companies indicated the credit squeeze as an uncertain element in the outlook. On the basis of last year's dividends, the yields from cable shares range, for instance, from 6¼ per cent on the shares of B.I.C.C. and L.E.W., to over 7¾ per cent on T.C. & M., about 8½ per cent on Scottish Cables, 8¾ per cent on Aberdare Cables and 9 per cent on Henley's.

Electrical Investments

Company or Board	Nom. Value	Middle price 24th Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Electrical Shares—continued						£ s d		
G.E.C. Ord.	£1	31/3		14	12½	—	58/9	37/6
G.E.C. 6½% Pref.	£1	21/-		6½	6½	6 3 9	23/6	19/6
General Cables	5/-	12/-		30	24	10 0 0	15/6	11/6
Greenwood & Batley	£1	47/3		17½	17½	7 8 3	51/3	45/3
Hackbridge Holdings	5/-	8/3	−9d	30	20	12 2 6	21/9	11/3
Hackbridge & Hewittic	5/-	10/-	−1/3	23	20	10 0 0	16/-	10/-
Head Wrightson	5/-	17/9	−1/-	20	22½	—	24/3	16/6
Heatrae	2/-	4/9		15	15	6 6 3	4/9	4/-
Henley's	10/-	12/6		11½	11½	9 4 0	17/-	11/-
Holophane	5/-	13/3		30	37½	8 9 9*	15/9	10/3
Hoover	5/-	32/6		50	50	7 13 9	44/-	24/9
I.C.I.	£1	37/-	−6d	10	10	5 8 0	46/6	36/3
Intl. Combustion	5/-	23/6	+1/6	22½	25	5 6 6	30/-	19/3
Johnson & Phillips	£1	16/9	−9d	15	10	11 18 9	34/6	18/9
Lancashire Dynamo	£1	31/3		11	11	7 0 9	45/9	33/6
Laurence, Scott	5/-	12/9	−6d	15	15	5 17 9	19/9	13/9
Lister, R. A.	£1	23/9	−6d	10	10	8 8 6	33/9	23/3
London Elec. Wire	£1	40/-	−1/3	12½	12½	6 5 0	53/9	40/9
Lucas, J.	£1	29/6		7½	7½	5 1 9	36/6	27/6
Marconi Marine	£1	31/-	−1/-	10	10	6 9 0	37/-	30/-
Marryat & Scott	2/-	10/6		30	35	6 13 3	13/-	8/-
Mather & Platt	£1	46/3	+1/3	15	15	6 9 9	63/9	47/-
Metal Industries	£1	25/-	−6d	Nil	9	7 4 0	30/-	20/3
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	52/6	45/-
Morphy-Richards	4/-	15/-		50	20*	5 6 9	20/-	11/6
Murex	£1	55/6		20	20	7 4 3	79/6	58/3
Newman Ind.	2/-	2/9		10	10	7 5 6	2/11	2/1
Oldham & Son	1/-	2/6		17½	17½	7 0 0	3/-	2/3
Parnall (Yate)	5/-	6/-		12	12	10 0 0	8/9	5/9
Parsons, C. A.	£1	44/6	−6d	8½	7½*‡	—	71/3	45/-
Plessey	10/-	56/3		30	30	5 6 9	86/3	60/-
Pye "A" Deferred	5/-	11/3		12½	12½	5 11 0	20/-	12/-
Reyrolle	£1	75/-	−3/9	16½	17½	4 10 3	110/-	72/-
Rheostatic	4/-	7/9		18½	12½*	6 9 0	10/-	7/-
Richardsons Westgarth	10/-	14/-	−1/-	16½	16½	5 19 0*	20/-	13/6
Scottish Cables	4/-	12/9		27½	27½	8 12 6	19/3	13/3
Simon-Carves	5/-	23/9		28½	20*	4 4 3	36/3	23/9
Smith (England), S.	4/-	7/6		17½	20	5 6 9*	8/-	6/3
Southern Areas	£1	10/3	−1/-	7½	7½	14 12 9	20/-	11/3
Strand Elec.	5/-	5/6	−3d	15	15	13 12 9	8/-	5/9
Sturtevant	5/-	18/-		15†	15†	4 3 3†	27/-	17/9
Sun Elec.	£1	47/6		25	25	10 10 6	47/6	42/-
Switchgear & Cowans	5/-	9/6		25	25	—	15/6	9/6
Taylor Tunnicliff	5/-	12/9	+6d	15	17½	6 17 3	13/9	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	41/3	35/-
T.C. & M.	£1	21/6		8½	8½	7 18 3	31/-	23/6
Telephone Mfg.	5/-	5/-	−3d	10	10	10 0 0	8/-	5/3
Telephone Rentals	5/-	10/6		12½	12½	5 19 0	12/6	9/6
Thompson (John)	5/-	24/-		25	25	5 4 3	37/-	23/6
Thorn Elec.	5/-	20/-		15	17½	4 7 6	26/3	16/3
Thornycroft	£1	21/9	−2/6	12½	12½	11 9 9	37/6	21/3
Tube Investments	£1	48/9		13¾	15	6 3·0	70/-	51/3
Vactric	5/-	14/6		17½	25	8 12 6	23/9	12/9
Veritys	5/-	5/3		12½	12½	11 18 3	9/3	6/9
Walsall Conduits	4/-	12/-		20	20	6 13 3	15/-	11/-
Ward & Goldstone	5/-	24/-		35	40	4 3 3*	29/-	18/6
Watford	2/-	5/6		25	25	9 1 9	6/9	5/9
Westinghouse	£1	36/3		18	10*	5 10 3	41/3	28/9
West, Allen	5/-	9/9		15	15	—	13/6	9/6
Wolf Electric	5/-	8/-	−1/-	20	20	6 5 0*	13/9	8/9

March Dividends

With the publication of the 1957 results of G.E.C. and English Electric, and those of A.E.I. expected very shortly, the dividend season in the electrical equipment market is already well under way. It does not usually reach its climax until April, but next month is likely to produce a number of interesting announcements. Of companies in the telephone group, Ericssons last declared their final dividend early in March. Other companies whose results appeared last year in the first half of March included Rheostatic and A. F. Bulgin, while those from Switchgear & Cowans, A. H. Hunt (Capacitors), Veritys and Wolf Electric were announced later in the month.

Shares on Offer

Among the electrical shares quoted at relatively small prices, the 2s shares of Bowthorpe Holdings have been offered lately at around 7s. A share-for-share scrip issue has been distributed since last year's 37½ per cent dividend, and allowing for that the yield basis is a little under 5½ per cent. The interim dividend for the latest year was raised by a fraction, and the final is due in about two months' time. Last year's report described the order position as most encouraging. Contactor Switchgear have also made a scrip issue, in the proportion of one-for-two, since the last dividend of 20 per cent. Assuming a decrease in the rate in proportion to the increase in capital, the yield on the 5s shares at 9s 6d is 7 per cent. This company's last report also spoke well of orders in hand.

Radio Rentals Issue

New 5s shares issued by Radio Rentals, in connection with an acquisition, have been available at a premium of about 2s 6d on the price of 24s at which they are offered to the company's shareholders. On the increased capital, the directors expect to maintain the dividend at the 30 per cent rate paid for 1956–7, so that the prospective yield approaches 5¾ per cent. Last month the publication of accounts for the year ended in August showed another of the substantial advances in earnings which have been a regular feature of each successive report during the past decade, and have made the shares one of the most successful of post-war investments. In the first quarter of the current year trading is stated to have remained satisfactory, although operating costs continue to rise.

REPORTS and DIVIDENDS

Mather & Platt, Ltd.—The consolidated profit for 1957 amounted to £2,054,423, as compared with £1,875,764 for the preceding year, and after providing £988,215 for taxation, the net balance is £1,063,959 (against £915,712). Of this, £161,679 is retained by subsidiaries and £600,000 is placed to general reserve. It is proposed to pay a final dividend of 6 per cent, and a bonus of 5 per cent, maintaining the distribution for the year at 15 per cent on increased capital. The balance carried forward is £118,461 (against £121,720 brought in).

Thomas Bolton & Sons, Ltd.—The trading profit for 1957 amounted to £241,364, as compared with £449,114 for 1956 and after deducting £20,755 for taxation, and £32,973 off trade investments, the net balance is £71,941 (against £260,348), to which is added £30,000 transferred from reserve for stock losses. It is proposed to pay a final dividend of 7½ per cent (against 10 per cent, which included a bonus of 2½ per cent), making 10 per cent for the year (12½ per cent), and to carry forward £259,581 (against £219,612 brought in).

The British Oxygen Co., Ltd., reports group profits for the year to 30th September last of £9,181,548, an increase of £1,372,785 as compared with the preceding year. After deducting £3,217,463 for depreciation and £3,215,099 for taxation, the net profit is £250,133 higher at £2,748,986, of which £2,440,245 is available to the holding company. The ordinary dividend for the year is maintained at 10 per cent, with a final dividend of 6 per cent.

The Barbados Electric Supply Corporation, Ltd.—The net profit for the year ended 30th June last was £23,326, as compared with £12,394 for 1955-56. The dividend for the year is unchanged at 5 per cent, free of tax, and the balance carried forward is £13,223 (against £11,384 brought in).

Richard Johnson, Clapham & Morris, Ltd., have declared an interim dividend of 5 per cent (unchanged).

Parmiter, Hope & Sugden, Ltd., have announced an interim dividend of 7½ per cent (unchanged).

Clarke, Chapman & Co., Ltd., report that after meeting all charges, including £626,802 for taxation, the net profit for 1957 is £555,641, as compared with £755,112 for 1956. Reserves receive £420,000 and the ordinary dividend for the year is unchanged at 27½ per cent.

Radio Rentals, Ltd., is offering ordinary shareholders 407,494 ordinary shares of 5s each at 24s a share in the proportion of one for every nine held. Excess share applications are invited. The offer is in connection with the purchase by the company of the ordinary capital of Hyman Lazarus Cabinets for £820,481, which has been satisfied as to £488,992 16s by the issue to the vendors of 407,494 ordinary shares of 5s each and as to £331,488 4s in cash.

New Companies

Arielflux, Ltd.—Registered 14th February. Capital £5,000. Manufacturers of and dealers in electrical goods, radio and television receivers, components, etc. Directors: H. V. Bolsom and H. H. Warner. Regd. office: 125, Edgware Road, W.2.

F. R. Wright & Co., Ltd.—Registered 12th February. Capital £3,000. Electrical engineers, etc. Directors: F. R. Wright and L. G. Marsh. Regd. office: 1, Halford Street, Leicester.

Replacement Tube Co., Ltd.—Registered 12th February. Capital £100. Electronic, radio and electrical specialists, etc. Directors: G. Steinfield and J. A. Field. Regd. office: 1, Barston Road, S.E.27.

Tapegrams, Ltd.—Registered 12th February. Capital £2,000. To manufacture, buy and sell tape recorders, radiograms, sound equipment, radio and television sets, etc. Directors: E. A. Holley, W. R. Curtis and W. A. Holley. Regd. office: 315, Camberwell Road, S.E.5.

Automation Research, Ltd.—Registered 12th February. Capital £2,000. Directors: W. R. Scott (permanent chairman) and Mrs. Anne E. Scott. Regd. office: 133, Moorgate, E.C.2.

Samson Controls (London), Ltd.—Registered 7th February. Capital £1,500. Dealers in valves, automatic controls and automation equipment, etc. Solicitors: Stafford Clark & Co., 3, Laurence Pountney Hill, E.C.4.

Thompson & Skippins, Ltd.—Registered 13th February. Capital £1,000. Manufacturers of and dealers in electrical goods of all kinds, radio and television receivers, components, etc. Directors: S. C. Skippins and A. J. Thompson (secretary). Regd. office: 86, Church Road, Tottenham, N.17.

C. W. Clifford, Ltd.—Registered 13th February. Capital £1,000. To acquire the business of manufacturers of and dealers in radio, television, gramophones and electrical equipment carried on by Charles W. Clifford and Josephine Clifford as "C. W. Clifford," at 114, High Street, Alfreton, Derbys. Directors: C. W. Clifford and Josephine Clifford (secretary). Regd. office: 114, High Street, Alfreton.

Peter Melton, Ltd.—Registered 14th February. Capital £3,000. Manufacturers of and dealers in radio goods, radio receivers and transmitters, television sets, etc. Directors: Mrs. Eva Melton, P. Melton and Mrs. Margaret Bailey. Regd. office: 43, London Road South, Poynton, Cheshire.

Miller and Edwards, Ltd.—Registered 18th February. Capital £500. Manufacturers of and dealers in electrical apparatus of all kinds, etc. Directors: W. Miller and Florence P. Holmes. Regd. office: 329, High Holborn, W.C.1.

I. F. Ashworth, Ltd.—Registered 18th February. Capital £1,000. Radio and television engineers, etc. Mrs. Imelda F. Ashworth is the first director. Regd. office: 3, Regent Street, Clifton, Bristol.

Increases of Capital

J. G. Sneath, Ltd.—Increased by £5,000 in £1 ordinary shares, beyond the registered capital of £15,000.

Walsall Electrical Co., Ltd.—Increased by £10,000 in £1 ordinary shares, beyond the registered capital of £10,000.

Trojan (Radioelectric), Ltd.—Increased by £15,000, in £1 ordinary shares, beyond the registered capital of £15,000.

Simms Motor & Electronics Corporation, Ltd.—Increased by £3,100,000, in 5s ordinary shares, beyond the registered capital of £900,000.

British Home & Office Telephone Co., Ltd.—Increased by £10,000, in £1 ordinary shares, beyond the registered capital of £15,000.

Bankruptcies

F. J. Smith, lately carrying on business under the style of Pembroke Electrics, 8, Pembroke Road, Torquay, electrical engineer.—Receiving order made 12th February on debtor's own petition.

B. Young, 29, Cotesbach Road, Clapton, London, E.5, wholesale dealer in electrical fittings, lately carrying on business at 16, Curzon Street, W.1.—First meeting 5th March and public examination 25th March at Bankruptcy Buildings, Carey Street, London, W.C.2.

G. S. Douthwaite, 25, Dean Street, Newcastle-upon-Tyne, trading as G. S. Douthwaite & Co., electrical engineer.—Last day for receiving proofs for dividend 4th March. Trustee, Mr. N. Saddler, Clarendon House, Clayton Street West, Newcastle-upon-Tyne, 1, Official Receiver.

J. J. Glover, 24, Market Place, Reading, electrical contractor.—Last day for receiving proofs for dividend 4th March. Trustee, Mr. W. J. W. Hill, 58-61, York Terrace, Regent's Park, London, N.W.1, Official Receiver.

J. Summerly, 93, Mowbray Road, South Shields, electrician.—Last day for receiving proofs for dividend 4th March. Trustee, Mr. N. Saddler, Clarendon House, Clayton Street West, Newcastle-upon-Tyne, 1, Official Receiver.

F. W. Mason, trading as F. W. Mason & Son, at 20, Shamrock Avenue, Ipswich, electrical contractor and radio and television engineer.—Second dividend of 1s 6d in the £, payable at Archdeacons House, Northgate Street, Ipswich.

L. G. Brown, dealer in household and electrical equipment, lately carrying on business at 31a, Colin Road, Luton, Beds.—Trustee, Mr. H. C. Hedges, 4, Charterhouse Square, London, E.C.1, appointed 10th February.

P. C. W. G. Jarvis, electrician, formerly dairyman and pig breeder, previously residing and carrying on business in partnership with another as electrical contractors under the style of Jarvis & Evans at "Four Winds," Stafford Road, Huntingdon.—Trustee, Mr. W. H. Haigh, Somerset House, 37, Temple Street, Birmingham, Official Receiver, released 10th February.

D. E. J. Daniels, lately carrying on business at 27, New Street, Worcester, as an electrical engineer under the name of Douglas Electrical Repair Company.—Trustee, Mr. W. H. Haigh, Somerset House, 37, Temple Street, Birmingham, Official Receiver, released 11th February.

Liquidations

Marples & Thomas, Ltd., electrical engineers and contractors, Bedford House, Bank Road, Matlock.—Members' voluntary winding up. Liquidator, Mr. K. MacNeill Black, Dale Road, Matlock. Appointed 15th February. Particulars of claims to the liquidator by 8th March.

J. F. Wilkinson & Son, Ltd., heating and electrical engineers, 351, Wellingborough Road, Northampton.—Winding up voluntarily. Liquidators, Mr. H. Bullard, 32, Guildhall Road, Northampton, and Mr. J. B. Corrin, Castilian Chambers, Castilian Street, Northampton, appointed 5th February.

Britton Electronic, Ltd. (In voluntary liquidation).—Particulars of claims by 18th March to the liquidator, Mr. F. Goodman, 77, Portland Place, London, W.1.

Pentlyke Electrical Co., Ltd. (Members' voluntary liquidation).—Meeting of members on 25th March at 11, Old Jewry, London, E.C.2, to receive an account of the winding-up by the liquidator, Mr. J. N. Prentice.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 3rd March

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre. Joint meeting with Graduate and Student Section. Three short papers.

CHATHAM. — Medway College of Technology, Maidstone Road, 7 p.m. I.E.E. Maidstone District meeting. Informal evening on "Electronics and Automation"; talk by Dr. H. A. Thomas on "Some Industrial Applications."

HANLEY.—Town Hall, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "D.C. Winder Drives Using Mercury-Arc Rectifier/Inverters," by L. Abram, J. P. McBreen and J. Sherlock.

ILFORD.—Angel Hotel, 8 p.m. A.S.E.E. North East London Branch. "Cold Cathode Lighting," by G. Robinson.

IPSWICH.—Crown & Anchor Hotel, 6 p.m. I.E.E. East Anglian Sub-Centre. "The B.B.C. Sound Broadcasting on Very-High Frequencies," by E. W. Hayes and H. Page.

LEEDS.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Earth Leakage Protection," by J. A. Robbins.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Advanced Types of Power Reactors," by J. V. Dunworth.

Exchange Hotel, Tithebarn Street, 6.45 for 7 p.m. E.C.A. Liverpool Branch. Annual dinner.

LONDON.—Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Graduate and Student Section. "The Application of Nuclear Energy to Power Production," by T. R. Puzey.

White Hall Hotel, W.C.1, 6.30 p.m. A.S.E.E. Central London Branch. "The Testing of Electrical Circuits and Apparatus," by Dr. J. S. Forrest.

NEWCASTLE-UPON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. Informal lecture on "Radio in the Air Sea Rescue," by G. W. Hosie, D. Kerr and W. Kiryluk.

Tuesday, 4th March

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "The Digital Computer Applied to the Design of Large Power Transformers," by W. A. Sharpley and J. V. Oldfield.

25, Charlotte Square, 7 p.m. Incorporated Plant Engineers, Edinburgh Branch. Annual general meeting.

HAMMERSMITH.—Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. "De-Gaussing—Theory, Design and Operation," by Cmdr. W. H. Petrie.

LONDON.—Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. "Some Impressions of Technical and Industrial Training in the United States," opened by Dr. K. R. Sturley.

At the Institution of Electrical Engineers, Savoy Place, W.C.2, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. "The Use of Rectangular Loop Magnetic Material in Electronic Switching Circuits," by E. L. Bubb and K. R. Wilderspin.

At the Royal Society of Arts, John Adam Street, Adelphi, Strand, W.C.2, 7 p.m. Incorporated Plant Engineers. "Plant Engineers in a Changing Britain," by L. G. Northcroft.

MANCHESTER.—Free Trade Hall, 7 p.m. I.E.E. North-Western Centre. Faraday Lecture on "The Electrification of the British Railways," prepared by the late G. H. Fletcher, delivered by R. Ledger.

PETERBOROUGH.—White Lion Hotel, Church Street, 7.30 p.m. Incorporated Plant Engineers, Peterborough Branch. "Electronic Control of Machine Tools," by N. Milne.

READING.—University, London Road, 7.15 p.m. A.S.E.E. Oxford, Reading and Districts Branch. "Education in the Electrical Industry," by W. H. Brooks.

STOKE-ON-TRENT.—North Stafford Hotel, 6 p.m. I.E.S. Stoke-on-Trent Group. "Blackpool Illuminations," by H. Carpenter.

Tuesday, 4th March, to Thursday, 6th March

LONDON. — Royal Hotel, Woburn Place, W.C.1. Television Society. Annual exhibition.

Tuesday, 4th March, to Saturday, 29th March

LONDON.—Olympia. Ideal Home Exhibition.

Wednesday, 5th March

BARNSLEY.—Town Hall, 7 p.m. Joint meeting of the I.E.E. North Midland Centre and the Sheffield Sub-Centre. "Earth Electrode Systems for Large Electric Stations," by J. D. Humphries.

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 7 p.m. Junior Institution of Engineers, Midland Section. Presidential address on "The Origin and Function of R.E.M.E.," by Major-General W. A. Lord.

EDINBURGH.—Y.M.C.A. Social Room, 14, South Saint Andrew Street, 6.15 p.m. I.E.S. Edinburgh Centre. "Open Space Lighting," by M. W. Peirce and H. F. Stephenson.

GLASGOW.—At the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, C.2, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "The Digital Computer Applied to the Design of Large Power Transformers," by W. A. Sharpley and J. V. Oldfield.

At the Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, 8 p.m. A.S.E.E. Glasgow Branch. "Modern Installation Practice," by A. V. Logie.

HALIFAX.—Crown Hotel, Horton Street, 7.45 p.m. A.S.E.E. Halifax Branch. "Earth Leakage Protection of Domestic and Similar Installations," by J. A. Robbins.

HARRINGAY.—"Queen's Head," 677, Green Lanes, N.4, 7.45 p.m. A.S.E.E. North London Branch. "Bakelite Materials," with film entitled "To Shape Tomorrow."

KENDAL. — N.W.E.B. Demonstration Theatre, Finckle Street, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. "The Measurement of Earth Loop Resistance," by Dr. G. F. Tagg.

LEICESTER.—Leicester Technical College, 7 p.m. Incorporated Plant Engineers, Leicester Branch. "Electrostatic Filters," by M. Penrose.

LONDON.—I.E.E. London Graduate and Student Section, 2 p.m. Visit to Long Distance Telephone Exchange, Faraday Building, E.C.4.

Central Hall, Westminster, 6.30 p.m. Centenary lecture, "Siemens Brothers, 1858-1958—100 Years of Electrical Engineering," by Dr. J. N. Aldington.

MANCHESTER. — Engineers' Club, Albert Square, 7 p.m. A.S.E.E. Manchester Branch. "N.I.C.E.I.C.", by H. F. Smith.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, Corporation Road, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "Earthing of Low- and Medium-Voltage Distribution Systems and Equipment," by F. Mather.

NEWCASTLE-UPON-TYNE. — King's College, College Road, 6.15 p.m. I.E.S. Newcastle-upon-Tyne Centre. "Colour Matching Problems," by A. Wilcock.

PRESTON. — R.A.F.A. Club, East View, 7.30 p.m. A.S.E.E. Preston Branch. "Electric Space Heating—Floor Warming Cables," by R. Tearse.

ROCHESTER.—King's Head Hotel, High Street, 7 p.m. Incorporated Plant Engineers, Kent Branch. Annual general meeting.

RUGBY.—Rugby College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Graduate and Student Section. "Nuclear Power Reactor Control," by J. A. Darke.

SOUTHAMPTON.—Southampton University, 6.30 p.m. I.E.E. Southern Centre. "Electrical Floor Warming," by J. W. Moule and W. M. Stevenson.

Polygon Hotel, 7.30 p.m. Incorporated Plant Engineers, Southern Branch. Annual general meeting, followed by films.

STAFFORD.—Technical College, 7.15 p.m. I.E.E. North Staffs. Sub-Centre, Graduate and Student Section. "Problems of Applying Electrical Equipment in the Steel Industry," by G. W. Pate.

WOLVERHAMPTON. — Wolverhampton College of Technology, 7.15 p.m. Institution of Production Engineers, Wolverhampton Section. "Computer Control of Machine Tools," by O. S. Puckle.

Thursday, 6th March

CARDIFF.—Demonstration Theatre, South Wales Electricity Board, The Hayes, 6 p.m. I.E.S. Cardiff Centre. "The Architect's Approach to Lighting," by G. Grenfell Baines.

CHELMSFORD. — Crompton's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Printed Wiring," by E. Davies.

GLASGOW.—Lighting Service Bureau of Scotland, 29, St. Vincent Place, 6.30 p.m. Annual general meeting, followed by "Open Space Lighting," by M. W. Peirce and H. F. Stephenson.

LIVERPOOL.—Liverpool Philharmonic Hall, 6.45 p.m. I.E.E. Mersey and North Wales Centre. Faraday Lecture on "The Electrification of the British Railways," prepared by the late G. H. Fletcher, delivered by R. Ledger.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. "Results of Full Scale Stability Tests on the British 132 kV Grid System," by F. Busemann and W. Casson, followed by "The Organisation for Large Scale Grid System Tests," by Dr. F. H. Last, E. Mills and N. D. Norris.

Grosvenor House, Park Lane, W.1, 7 for 7.30 p.m. Siemens Bros. & Co., Ltd., centenary dinner.

"Prince of Wales" Hotel, Wimbledon, 8.30 p.m. A.S.E.E. South West London Branch. Sixth Electrical Engineers Exhibition Film.

MANCHESTER.—The University, 7 p.m. I.E.E. North-Western Graduate and Student Section. "The Oscillating Induction Motor," by P. J. Lawrenson.

NOTTINGHAM.—E.M.E.B. Demonstration Theatre, Smithy Row, 6 p.m. I.E.S. Nottingham Centre. "The History of Mine Lamps," by Miss H. M. Maurice.

SOUTHAMPTON.—Polygon Hotel, 8 p.m. A.S.E.E. Southampton Branch. "Transatlantic Communications Cable," by R. J. Jordan.

Friday, 7th March

ABERDEEN. — Robert Gordon's College, 7.45 p.m. Institute of Marine Engineers, Scottish Section. "Nuclear Steam Propulsion for Merchant Ships," by W. R. Wootton.

BIRMINGHAM.—Grand Hotel, 7 p.m. Birmingham Electric Club. Ladies' evening.

BLACKBURN.—Assembly Hall. Incorporated Plant Engineers, Blackburn Branch. Annual dinner.

LIVERPOOL. — Liverpool Engineering Society, 9, The Temple, 24, Dale Street, 7.30 p.m. A.S.E.E. Liverpool and District Branch. "Through Central Europe," by J. G. P. Anderson.

LONDON.—Pepys House, 14, Rochester Row, Westminster, S.W.1, 7 p.m. Junior Institution of Engineers. "All the Better to See" and "Fitting Conclusion"—films.

MANCHESTER.—Grand Hotel. Manchester Association of Engineers. Dinner and dance.

READING. — Caversham Bridge Hotel. A.S.E.E. Oxford, Reading and Districts Branch. Annual dinner.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 5th March from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

35524. Metropolitan-Vickers Electrical Co., Ltd.—Magnetic crack detection. 14th December, 1954. (791650.)

1954

1080. Electric & Musical Industries, Ltd. —Range measuring radio pulse transmitting and receiving systems. 23rd December, 1954. (791431.)

2916. Pirelli-General Cable Works, Ltd., and Penrose, J. R.—Machines and methods for corrugating electric cable sheaths. 31st January, 1955. (791513.)

2943. General Electric Co., Ltd.—Machines and methods for corrugating tubes. 31st January, 1955. (791514.)

7486. Babcock & Wilcox, Ltd.—Tubulous vapour generating and vapour heating units. 30th November, 1955. (791517.)

16559. Davie, O. H.—Cathode-ray tubes. 26th April, 1955. (791432.)

17216. Patelhold Patent-Verwertungs- & Electro-Holding Akt.-Ges.—Device for supporting a longitudinally oscillating rod particularly a magnetostrictively excited rod. 11th June, 1954. (791550.)

19180. Superheater Co., Ltd., and Stewart, W.—Steam superheater elements. 30th June, 1955. (791591.)

21797. British Insulated Callender's Cables, Ltd.—Machines for stranding wires. 26th July, 1955. (791592.)

22909. Brown, F. L. R.—Electric accumulators. 28th July, 1955. (791501.)

24196. I-T-E. Circuit Breaker Co.—Arc extinguishing means for high voltage electric circuit-breakers. 19th August, 1954. (791613.)

31531. General Electric Co., Ltd.—Electrical apparatus of the kind including a cathode-ray tube. 1st November, 1955. (791434.)

32221. National Research Development Corporation.—Construction of electronic apparatus. 8th November, 1955. (791435.)

34948. Babcock & Wilcox, Ltd.—Tubulous vapour generating and vapour heating units. 2nd December, 1955. (791452.)

36002. Cinema-Television, Ltd.—Manufacture of internally coated envelopes for electron discharge devices. 12th December, 1955. (791436.)

1955

2961. Mullard Radio Valve Co., Ltd.—Electric trigger circuits employing transistors. 13th April, 1956. (Addition to 767727.) (Cognate application 18871, 29th June, 1955.) (791544.)

3232. I-T-E. Circuit Breaker Co.—Electric arc extinguishing plate assembly. 3rd February, 1955. (791614.)

4299. Licentia Patent-Verwaltungs-Ges.—Voltage regulator. 14th February, 1955. (791595.)

5900. British Transport Commission, and Higgins, S. L.—Mechanism for operating electric detectors associated with railway track points. 28th February, 1956. (791654.)

8453. Mullard Radio Valve Co., Ltd.—Electric trigger circuits. 26th March, 1956. (791545.)

9958. British Thomson-Houston Co., Ltd. —Electrical contact brushes for high altitude electrical equipment. 28th March, 1956. (791598.)

10943. Naamlooze Vennootschap Onderzoekingsinstituut Research.—Process for treating products having a low electric conductivity to reduce their tendency to electrostatic charging. 15th April, 1955. (791476.)

11545. Philips Electrical Industries, Ltd. —High-frequency automatic gain control circuits. 21st April, 1955. (791524.)

12773. Hunt (Capacitors), Ltd., A. H.—Electrical capacitors. 2nd May, 1956. (791627.)

14065. Mullard Radio Valve Co., Ltd.—Electric rectangular-wave generator circuits, relaxation oscillator circuits and trigger circuits. 25th November, 1955. (791546.)

15568. Mullard Radio Valve Co., Ltd.—Electric circuit arrangements employing transistors for generating substantially linear voltage changes. 31st March, 1955. (791547.)

16191. Burney, Sir C. D.—Deep sea trawling with the aid of electronic echo-sounding equipment. 31st January, 1956. (Cognate application 16860, 11th June, 1955.) (791615.)

20344. Radio Corporation of America.—Apparatus for reproducing electrical signals from movable records. 13th July, 1955. (791439.)

21112. ACF. Industries, Inc.—Wiring systems for electrical apparatus. 21st July, 1955. (791440.)

22960. General Electric Co., Ltd.—Excitation arrangements for rotary dynamo-electric machines. 20th July, 1956. (791629.)

23346. Anulf, K. A.—Automatic fault identifying and blocking devices in automatic telecommunication systems. 12th August, 1955. (791457.)

27895. Standard Telephones & Cables, Ltd.—Method of producing electrically conductive and transparent layers on insulating bodies. 30th September, 1955. (791667.)

29105. Air Reduction Co., Inc.—Electric arc welding. 12th October, 1955. (791459.)

35416. Kienzle Apparate Ges.—Process and device for generating electrical pulse groups. 9th December, 1955. (791461.)

1956

1138. Busch-Jaeger Dürener Metallwerke Akt.-Ges.—Electric time switching device. 12th January, 1956. (791636.)

6444. Radio Materials Corporation.—Electric condenser. 1st March, 1956. (791465.)

8308. Standard Telephones & Cables, Ltd.—Magnetic storage device. 16th March, 1956. (791641.)

14161. Etablissements P. Carrier.—Combined electric plug and socket connector and make and break device. 7th May, 1956. (791450.)

14415. Philips Electrical Industries, Ltd. —Cathode-ray tubes. 9th May, 1956. (791486.)

15107. Western Electric Co., Inc.—Contact welding apparatus. 15th May, 1956. (791582.)

15944. Chromatic Television Laboratories, Inc.—Methods of manufacturing cathode-ray tubes for reproducing colour television images. 23rd May, 1956. (791646.)

18462. Metallges. Akt.-Ges.—Method of and apparatus for the electrostatic purification of waste gases. 14th June, 1956. (791575.)

21049. Compagnie Française Thomson-Houston.—Semi-conductor rectifiers. 6th July, 1956. (791491.)

24170. Philips Electrical Industries, Ltd. —Television circuit arrangements. 7th August, 1956. (791494.)

25371. Philips Electrical Industries, Ltd. —Cathodes of the dispenser type. 20th August, 1956. (791495.)

34818. General Electric Co.—Dynamo-electric machines. 14th November, 1956. (791500.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

5th March

ALTO (design). No. 767,414. Class 9. Flowmeters and electrical alarm systems in connection with them, etc.—Alto Instruments (Great Britain), Ltd., Maxwell House, 11, Arundel Street, Strand, London, W.C.2.

MAXILUME. No. B769,959. Class 9. Apparatus for viewing photographic, radiographic and like transparencies.—Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1/3, St. Paul's Churchyard, London, E.C.4.

CUBIGEAR (design). No. 767,545. Class 9. Electrical switchgear.—D. C. Engineering Co., Ltd., Lambrook House, Wincanton, Som.

DICTINA. No. 770,713. Class 9. Apparatus for recording and reproducing sound.—N.V. Philips' Gloeilampenfabrieken, Eindhoven, Holland. Address for service, c/o T. D. Threadgold, Century House, Shaftesbury Avenue, London, W.C.2.

12th March

VARISLIP. No. 771,556. Class 7. Electric motors (not for land vehicles) and parts included in Class 7.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.

PROGRESS. No. B758,404. Class 9. Terminal blocks.—M.T.E. Control Gear, Ltd., London Road, Leigh-on-Sea, Essex.

DICTET. No. 760,378. Class 9. Records of electric signals; and instruments and apparatus for the production of, and reproduction from, such records.—Dictaphone Corporation, New York. Address for service, c/o Stevens, Langner, Parry & Rollinson, 5/9, Quality Court, Chancery Lane, London, W.C.2.

Design. No. 760,456. Class 9. Transformers, chokes, inductances, and electronic apparatus and instruments included in Class 9. —Electro-Voice Products, Ltd., Maple Cross Industrial Estate, Denham Way, Rickmansworth, Herts.

SIMET. No. 768,644. Class 9. Electrical apparatus incorporating semi-conducting materials.—Semi-Metals, Ltd., 56, Vicarage Lane, Ilford, Essex.

AUSTRALITE. No. 769,473. Class 9. Electric cables and insulated electric wire.—H. Cramer (Export), Ltd., 36G, Dryden Chambers, 119, Oxford Street, London, W.1.

MENUMATIC. No. 769,546. Class 9. Electrical apparatus for controlling the operation of cooking installations and apparatus in accordance with predetermined time intervals; distribution boards and boxes; switches; indicating instruments for use in the control of heat; thermostats; coin-freed apparatus; and parts. —Jackson Industries, Ltd., 7, Stratford Place, London, W.1.

SILVER ARROW. No. 769,513. Class 9. Electric flat irons (sold complete).—Easipower, Ltd., 27, Albemarle Street, London, W.1.

GOOD COMPANION. No. B770,772. Class 9. Electric flat irons.—L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, Kingsway, London, W.C.2.

ELECTROCRYSTON. No. 771,267. ELECTROSIL. No. 771,268. Class 9. Electrical apparatus and instruments included in Class 9. —James A. Jobling & Co., Ltd., Wear Glass Works, Alfred Street, Millfield, Sunderland.

CREDA CENTREPOINT. No. 766,740. Class 11. Electric cooking and water heating apparatus. —Simplex Electric Co., Ltd., Broadwell, Oldbury.

Wavey WASHERS

Beryllium Copper "Wavey" Washers. For Electronic Components. Range 8BA to ¼. Corrosion resisting, non-damaging to components, higher resistance of "set", higher recovery of load, permanent spring action. They are fabricated from Beryllium copper, heat treated to VPN.350 minimum, Electro Plated to DTD.924, Cadmium Plated to DTD.904 and Passivated to DTD.923. Samples and price lists on request.

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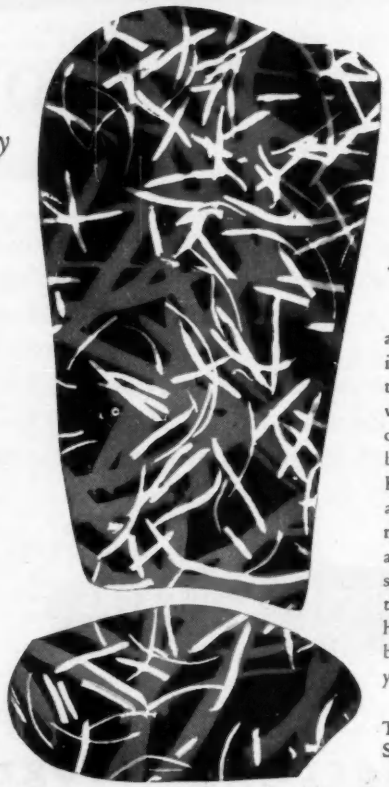

Refrasil

a lightweight fibrous silica material of very fine diameter, is being increasingly applied as a flexible high temperature electrical insulator. It is capable of withstanding continuously temperatures in the order of 1,000°C, or for short periods, even above. As well as being an excellent high temperature electrical insulator, Refrasil has outstanding thermal insulation characteristics at elevated temperatures. Like fused silica it has a high resistance to thermal shock and to chemical attack from acids. It is available as batt, felted wool, cloth, tape, sleeving, bulk fibre, cord, and yarn. There are many other things well worth your knowing about Refrasil; we have incorporated them all in a brochure which we would like to send you.

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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Argentina.—Water and Electric Power Board. 25th June. Electromechanical equipment for Cabra Corral hydro-electric power station. (E.S.B. 3993/58. Ten/30979.)*

Burma.—Burma Purchase Board. 10th March. Cord grip lampholders and regulators for fans. (E.S.B. 4512/58. Ten/31019.)* Water heaters. (E.S.B. 4513/58. Ten/31015.)*

Cardiff.—City Council. 17th March. Street lighting equipment. (See this issue.)

Cheltenham.—Town Council. 7th March. Rewiring part of the electrical installation at the public library and art gallery. G. Gould Marsland, borough surveyor, P.O. Box No. 12, Municipal Offices.

Durham.—County Council. Electrical installations in schools. (See this issue.)

Edinburgh.—North of Scotland Hydro-Electric Board. Cabling, electric lighting and small power services for Shin diversion weir. (See this issue.)

Faversham. — Borough Council. 20th March. Group "A" street lighting installation. (See this issue.)

Formosa.—Central Trust of China, Taipei. 11th March. Distribution transformers. 25th March. Power transformers. (E.S.B. 3853/58.I.C.A. Ten/30941.)* 13th March. Power cable and tubular copper busbar. (E.S.B. 3859/58.I.C.A. Ten/30940.)* 14th March. A.c.s.r. cables and accessories. (E.S.B. 3860/58.I.C.A. Ten/30957.)*

Greece.—Ministry of National Defence, Athens. 18th March. Electronic measuring instruments. (E.S.B. 4509/58. Ten/31034.)*

Hebburn (Durham).—U.D.C. 11th March. Electrical installations in 70 new houses on the Campbell Park housing site. R. C. Bestow, surveyor.

India.—Damodar Valley Corporation. 1st April. Ash handling plant for Durgapur power station. (E.S.B. 4636/58. Ten/31088.)*

Director General of Supplies and Disposals, New Delhi. 18th April. Four 7,667 kVA transformers. (E.S.B. 4304/58. Ten/30992.)*

Iraq.—Directorate General of Municipalities, Baghdad. 8th March. Insulated cables. (E.S.B. 4714/58. Ten/31072.)* 15th March. Insulators and insulator fittings. (E.S.B. 3903/58. Ten/30935.)*

Leeds.—Transport Committee. 10th March. Electric lamps (schedule F). A. B. Findlay, general manager, 1, Swinegate.

Rhodesia and Nyasaland.—Bulawayo City Council. 19th March. P.v.c. insulated and bare copper conductor and galvanised staywire. (E.S.B. 4633/58. Ten/31055.)*

Southern Rhodesian Electricity Supply Commission, Salisbury. 10th April. Two 10 MVA transformers and two auxiliary transformers. (E.S.B. 4325/58. Ten/30995.)*

Federal Tender Board, Causeway. 6th March. Two diesel driven standby generating sets. (E.S.B. 4255/58. Ten/31056.)*

South Africa.—Provincial Administration, Cape of Good Hope. 11th March. Electrical measuring instruments. (E.S.B. 4458/58. Ten/31009.)*

Union Tender and Supplies Board, Pretoria. 13th March. Two electric plating furnaces. (E.S.B. 4344/58. Ten/31010.)*

Stores Department, South African Railways, Johannesburg. 14th March. Paper insulated cable, cable end boxes, jointing material, loading coil cases, etc. (E.S.B. 4482/58. Ten/31032.)* 19th March. Underground armoured cable. (E.S.B. 4698/58. Ten/31066.)* 21st March. Copper wire and insulated cable. (E.S.B. 4697/58. Ten/31069.)* 2nd May. Traction substation convertor equipment. (E.S.B. 4308/58. Ten/31040.)*

Beaufort West Municipality. 12th March. One 200 kVA transformer. (E.S.B. 5096/58. Ten/31133.)*

Uruguay.—Administración General de las Usinas Eléctricas y los Teléfonos del Estado. 25th March. Two 180 kW generating sets. (E.S.B. 3917/58. Ten/30970.)*

Vietnam.—Central Purchasing Authority, Saigon. 19th March. Broadcast transmitters and other radio equipment. (E.S.B. 4548/58. I.C.A. Ten/31052.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Cheltenham.—Housing Committee. Recommended. Electrical installation work in 54 dwellings at Malvern Street (£1,591).—M. B. Owen.

Glasgow. — British Railways (Scottish Region). Installation of colour light signalling between Westerton and Bowling (Glasgow suburban electrification). — Metropolitan-Vickers-G.R.S.

Norwich. — City Water Committee. Recommended. Re-wiring of electrical installation at the Guildhall (£1,149).—Johnson, Pearce & Co.

Rochdale.—Corporation. Electrical installation work at Parish Church School (£1,293). —Ernest Stott.

Sheffield.—Regional Hospital Board. Reorganisation of the main lighting and auxiliary electrical services at Fir Vale Infirmary, Sheffield (£5,610).—Hall & Stinson.

Warrington.—Housing Committee. Electrical installations in 48 flats at Orford (£1,218).—W. E. Kidd.

Whittlesey.—Electrical installation in new junior school (£2,785).—Bowers & Barr.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aldridge. — Grammar/technical school; M. A. Boswell, Ltd., builders, Compton Road, Wolverhampton.

Alton.—Houses (112), Manor estate; F. T. Cornhill, U.D.C. surveyor, High Street.

Alvechurch.—Houses (59), Crabbs Cross; Buildings Contracts (Alvechurch), Ltd., 30, Callow Hill.

Barking.—Assembly hall, East Street; Jackson & Edmonds, architects, 116, Colmore Row, Birmingham.

Barnes.—Housing scheme, West Hall Road, Kew; W. R. Shepherd, borough engineer, Municipal Offices, Sheen Lane, S.W.14.

Flats (32), Mortlake Road; Major Constructors, Ltd., Alliance Works, Western Avenue, London, W.3.

Basildon.—Dwellings (400), Lee Chapel area; G. A. Jellicoe & Partners, architects, 12, Gower Street, London, W.C.1.

Beaworthy.—Science block at Shebbear College; Methodist Education Committee, 25, Marylebone Road, London, N.W.1.

Birmingham.—Multi-storey building for headquarters staff of Tube Investments, Ltd., Hagley Road/Harborne Road corner site, Five Ways (£750,000); J. Bradley Hall, of Jack Cotton & Partners, architects, Cavendish House, Waterloo Street, Birmingham.

Blandford.—Garage, showrooms and workshops, St. Leonards Road and Damory Court Street; R. E. Evans, Langton Road Garage.

Bootle.—C.E. junior school, Brown's Lane, Netherton; Quiggin & Gee, architects, 11, Old Hall Street, Liverpool.

Boston (Lincs).—Houses (30), Marian Road; Farrow Bros., builders, Wyberton Low Road.

Brighton.—Flats (72), Whitehawk, and houses (144) and four shops, Albion Hill redevelopment scheme; D. J. Howe, borough engineer, 26/30, King's Road.

Bristol.—Geriatric department at Southmead General Hospital (£300,000); South Western Regional Hospital Board, Parklands, Tyndalls Park Road, Bristol, 8.

Burton-on-Trent. — Out-patients' and casualty departments at General Hospital (£250,000); Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, Birmingham, 15.

Bushey.—Dwellings (148) for Harrow B.C.; Geo. Wimpey & Co., Ltd., 23, Hammersmith Grove, London, W.6.

Caernarvon.—Factory, Penygroes; Austin Hopkinson & Co., Ltd., Delta Works, Audenshaw, Manchester.

Canterbury.—Hotel and banqueting hall, St. Margaret's Street; Eugene C. Kent, architect for scheme, 6, Gray's Inn Road, London, W.C.1.

Castle Ward.—Houses (14); R.D.C. surveyor, Council Offices, Ponteland, Northumberland.

Cheltenham. — Offices and canteen; Costelloe & Kemple, Ltd., Alstone Lane.

Chester-le-Street.—Houses (74); U.D.C. surveyor.

Cumberland.—Secondary school at Egremont (£155,000); county architect, Portland Square, Carlisle.

Doncaster.—Additional buildings for Technical High School for Girls (£40,000); borough architect.

Durham.—Additions to the Birtley East Modern, Bradbury Modern C.E., Durham Girls' Grammar, Hebburn R.C. Aided, Shildon Timothy Hacworth and Winlaton Modern Schools; county architect, South Street, Durham.

Ealing.—Works extensions for United Phosphate & Malt Co., Ltd., Chase Road-Haymills, Ltd., builders, Hanger Green, London, W.5.

Eastbourne.—Flats, The Avenue and St. Leonards Road; Bargood Estates, Ltd., 18, Drydens Court, Parkley, Ham, Richmond, Surrey.

Edinburgh.—Extensions to Trinity Academy (£265,000); S. Ross Smith, architect, Heriot Row, Edinburgh.

Glasgow. — Crematorium, Linn Park (£190,000); Architects' Department, Municipal Buildings, George Square, Glasgow.

Great Missenden.—Flats and maisonnettes (27), Prestwood; James H. Cox, architect, 21, High Street, Aylesbury.

Harpenden.—Old people's dwellings (31), Breadcroft Lane and Batford; H. Pettingale, surveyor, Harpenden Hall.

Ipswich.—Houses (70), Chantry estate; W. Ames, Ltd., builders, Deneside, Great Yarmouth.

Isleworth.—Reconstruction of "Q" block, West Middlesex Hospital (£52,500); Crowther Builders, Ltd., Park Royal Road, London, W.3.

Kidderminster.—Administrative block at Market; borough engineer, 110, Mill Street.

Leicester.—Additional classrooms and gymnasium at Crown Hills Secondary School (£36,000) and first phase of £68,470 scheme for extensions to Wyggeston Boys' School; city architect.

Liverpool.—Works extensions; Wm. Whitby & Sons, Ltd., 18/22, The Elms.

London.—Office block, Homer Street, St. Marylebone; C.R.C. Investments, Ltd., 58, Haymarket, S.W.1.

Works extensions, South Lambeth: Brand & Co., Ltd., South Lambeth Road, S.W.8.

Development of the Maida Vale site (463 dwellings with lifts and electric floor heating, clubroom, doctor's house, surgery, etc.); H. Bennett, Architects' Department, County Hall, Westminster Bridge, S.E.1.

Loughborough.—Houses (100), Ashby Road estate; borough surveyor.

Luton.—Houses (287), Browning Road and Wordsworth Road; Abbey Homesteads, Ltd., 15, Thayer Street, London, W.1.

Lymm.—Conversions at Lymm Grammar School to form secondary modern school (£67,229); director of education, City Road, Chester.

Maldon.—Grammar school extensions (£47,000); county architect, County Hall, Chelmsford.

Houses (46), Latchingdon and Tillingham; L. H. Hiscott, clerk to R.D.C., Council Offices, Wantz Road, Maldon, Essex.

Mansfield.—Headquarters, Tothill Lane; St. John Ambulance Brigade, County Headquarters, 20, Castle Gate, Nottingham.

Middlesbrough.—Houses (400), and children's homes at Pallister Park and Easterside; J. A. Kenyon, borough engineer.

Milford Haven.—Administrative offices, stores, fire station and canteen for British Petroleum Co.; Shellabear Price, Ltd., contractors, 6, Queen Anne's Gate, London, S.W.1.

Morpeth.—Council offices and council chamber, Dacre Street (£25,000); J. K. Miles, surveyor, Rural Council, Dacre Street.

Newcastle-on-Tyne.—Shops (47), Longbenton and Kenton, for Arndale Property Trust, Ltd.; Chippindale & Co., agents, Howard House, Bank Street, Bradford.

Block of flats, Princess Street; city architect, 18, Cloth Market.

R.C. secondary school at Kenton; Reavell & Cahill, Lloyds Bank Chambers, Alnwick.

Offices, Belmont Street, for Moores Group; D. K. Wood, 1, West Road.

Northants. — Biology laboratory and domestic science room at Brackley High School; two extra science laboratories at Daventry Grammar School and additions to Northampton Grammar School; county architect, Northampton.

Norwich.—Flats (50), Haslips Opening estate; city architect

Nottingham. — Proposed civic theatre (£200,000) and two-storey extension to Guildhall; city engineer, Guildhall.

Paisley.—Houses (36), Potterhill (£94,000); J. McGregor, burgh surveyor, 14, Gilmour Street.

Poole.—Conversions at South Lytchett Manor to form secondary modern school (£103,000); Dorset county architect, County Hall, Dorchester.

Ralstock.—Municipal college; R. O. Harris, county architect, Park Street, Taunton.

Reading.—Extensions for St. Joseph's Convent School, Upper Redlands Road; Chas. Smith & Son, architects, 164, Friar Street.

Dwellings (70), London Road; Beeson Bros., Ltd., builders, Tidmarsh Road, Pangbourne.

Redditch.—Offices; Cross & Jones (Estates), Ltd., Evesham Street.

Richmond (Surrey).—Flats (64), Lower Mortlake Road site; borough engineer, Hotham House, Heron Court.

Richmond (Yorks).—Houses (16), Temple View; A. Anderson, borough engineer.

Ripon and Pateley Bridge.—Houses (103); R.D.C. architect, Council Offices, Pateley Bridge, Yorks.

Rutland.—School, Edithweston; county architect, Oakham, Rutland.

Sidmouth.—Three-storey blocks of flats at Lymebourne Park; R. Pickard, clerk to U.D.C., Council Offices, Sidmouth, Devon.

Southend-on-Sea.—Scheme for police headquarters; borough architect, 30, Alexandra Street.

South Shields.—Factory, Back Woodbine Street; Falcon Mures & Co., Ltd.

Spennymoor.—County modern school; county architect.

Stockport.—Dwellings (113), Brinnington estate; Roy & Partners, Ltd., builders, 66, Blackfriars Road, Manchester.

Stockton-on-Tees.—Houses (84), West Fairfield; Wimpey & Co., builders, Orchard House, Newcastle-on-Tyne.

Factory, Haverton Hill Road; Quayside Engineering Co., Ltd., Stockton.

Three-storey office block, Yarm Road; Ashmore, Benson, Pease & Co., Ltd., Stockton.

Sturminster Newton.—Secondary modern school; county architect, County Hall, Dorchester.

Sunderland.—New church, Red House estate (£50,000); Gordon Durham & Co., Ltd., contractors, East Boldon.

Sutton Coldfield. — New court house (£70,291); J. R. Deacon, Ltd., builders, Head Office, Lombard Street, Lichfield.

Houses (44), Kempson Avenue; H. Dare & Sons, Ltd., Alum Road.

Swindon.—Dwellings (359), Walcot and Park North estates; John Laing & Son, Ltd., builders, Bunns Lane, London, N.W.7.

Thirsk.—Houses and bungalows (36), Norby, for R.D.C.; Needham, Thorpe & White, architects, 5, High Petergate, York.

Tottenham.—Development scheme for Prince of Wales Hospital (£100,000); regional architect to N.E. Metropolitan Regional Hospital Board, 3, Queen Anne Street, London, W.1.

Wallsend.—Secondary school at Willington Quay and a grammar school on the Coast Road; county architect, County Hall, Newcastle.

Wantage.—Houses (68), for R.D.C.; surveyor, Rural Council Offices, Wantage, Berks.

Warrington.—Health services clinic, Sankey Street; borough architect.

Watford.—Factory, Holywell industrial estate; Watford Glass Co., Ltd., 19, Liverpool Road.

Weybridge.—Houses (40), Brooklands Road; John Farmer & Sons (Bldrs.), Ltd., 45, Hanworth Road, Sunbury-on-Thames.

Whitehaven. — Development of Valley estate for housing; W. H. J. Browne, town clerk, Town Hall.

Widnes.—Teaching block, assembly hall and workshops for College of Further Education; borough architect.

Willenhall.—Flats (54), High Street, Portobello; Five Oaks Estates, Ltd., Castlecroft Lane, Compton, Wolverhampton.

Willesden.—Flats (44), The Oaks site, Donnington Road; borough engineer, Town Hall, Dyne Road, Kilburn, N.W.6.

Worcester. — Laboratories, Whittington Road; Spicers, Ltd., builders, Ombersley Road.

Worcestershire.—Erection of kitchens at Broadwas C.E., Hagley County Primary, Kidderminster St. Ambrose R.C. and Stourport County Primary Schools; director of education, Castle Street, Worcester.

Wrexham.—Houses (306), Cefn Road/Hullah Road, Dean Road and Pentre Gwyn; J. M. Davies, borough engineer, 31, Chester Street.

CATALOGUES AND LISTS

AIR CONDITIONING.—Leaflet giving brief particulars of the company's self-maintaining air filters.—**Air Control Installations, Ltd.,** Ruislip, Middlesex.

BUSBAR SYSTEMS.—Leaflet giving particulars of the company's medium voltage rising main busbar system.—**Ottermill Switchgear, Ltd.,** Ottery St. Mary, Devon.

DIECASTINGS.—28-page booklet entitled "Aluminium Alloy Pressure Diecastings" dealing with the properties, design and use of diecastings in this material.—**Fry's Diecastings, Ltd.,** Brierley Hill Road, Wordsley, near Stourbridge.

INSTRUMENTS.—300-page bound catalogue giving descriptions, technical details and illustrations of the company's range of telecommunication measurement equipment and industrial electronic instruments. The types covered include signal sources; voltmeters; frequency, power, distortion and field strength meters; transmission measuring sets and station monitors. Other sections deal with oscilloscopes and spectrum and response analysers, deviation meters, Q-meters, and bridges. In addition, systems instrumentation and industrial X-ray apparatus and moisture meters are included. A comprehensive index is provided and a pocket inside the front cover contains a catalogue summary and a list of prices in the United Kingdom.—**Marconi Instruments, Ltd.,** St. Albans, Herts.

REFRIGERATION.—Booklet describing the service which the company offers for the servicing and maintenance of any type of refrigeration installation.—**Electrical Refrigeration & Radio Engineers (Epping), Ltd.,** 35, Little Russell Street, New Oxford Street, London, W.C.1.

SWITCHBOARDS.—Leaflet illustrating and describing various industrial switchboards manufactured by the company.—**Ottermill Switchgear, Ltd.,** Ottery St. Mary, Devon.

TELEPHONES.—Two illustrated leaflets dealing with telephone intercommunicating systems.—**English Telephone Co., Ltd.,** Electrical House, Neasden Lane, London, N.W.10.

TELEPRINTERS.—52-page publication (PT.56) entitled "An Introduction to Creed Teleprinters and Punched Tape Equipment."—**Creed & Co., Ltd.,** Telegraph House, Croydon, Surrey.

TERMINAL BOARDS.—Brochure giving particulars and dimensions of multi-way extensible terminal boards.—**Minerva Mouldings, Ltd.,** Minerva Works, Raans Road, Amersham, Bucks.

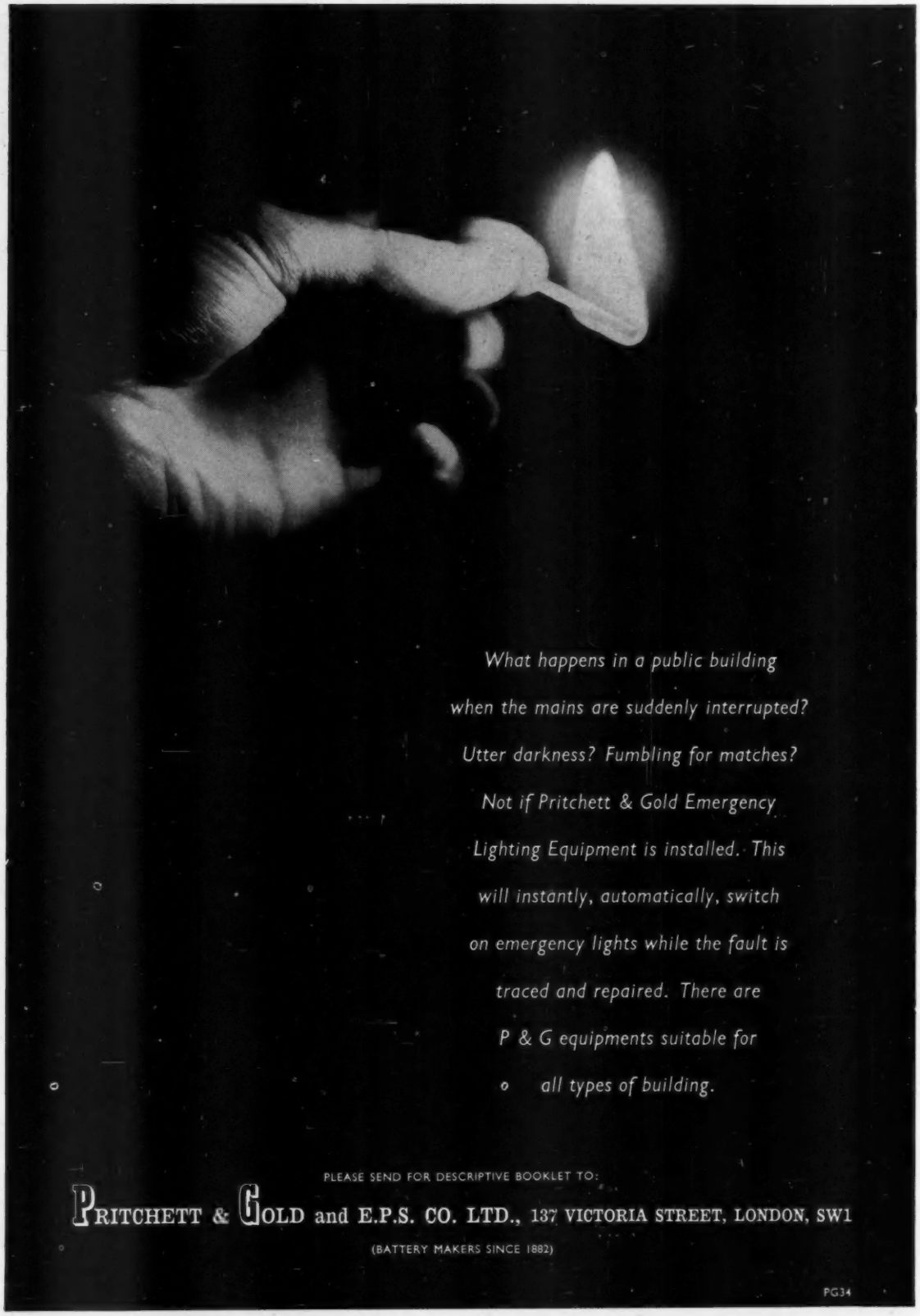
TERMINALS.—Illustrated 26-page catalogue giving particulars of the company's range of compression terminals and tools.—**Hellermann, Ltd.,** Crawley, Sussex.

THERMAL INSULATION. — 37-page booklet dealing with "Versil" glass fibre thermal insulation and showing examples of its use in the home and industry including applications in power stations.—**Versil, Ltd.,** Rayner Mills, Liversedge, Yorks.

TIME SWITCHES.—Brochure (A1000) describing the repair service offered by the makers of the "Gunfire" time switches for all types and makes of clockwork controllers, synchronous time switches, chronometers and other precision timepieces.—**British Foreign & Colonial Automatic Light Controlling Co., Ltd.,** 100, Holdenhurst Road, Bournemouth, Hants.

VARIABLE SPEED DRIVES.—Leaflet (NV.240) describing direct-to-mains "Varionic" variable speed drive equipment.—**Lancashire Dynamo Nevelin, Ltd.,** Hurst Green, Oxted, Surrey.

VOLTAGE REGULATORS. — 15-page descriptive brochure dealing with the company's stepless on-load voltage regulators.—**Brentford Transformers, Ltd.,** Manor Royal, Crawley, Sussex.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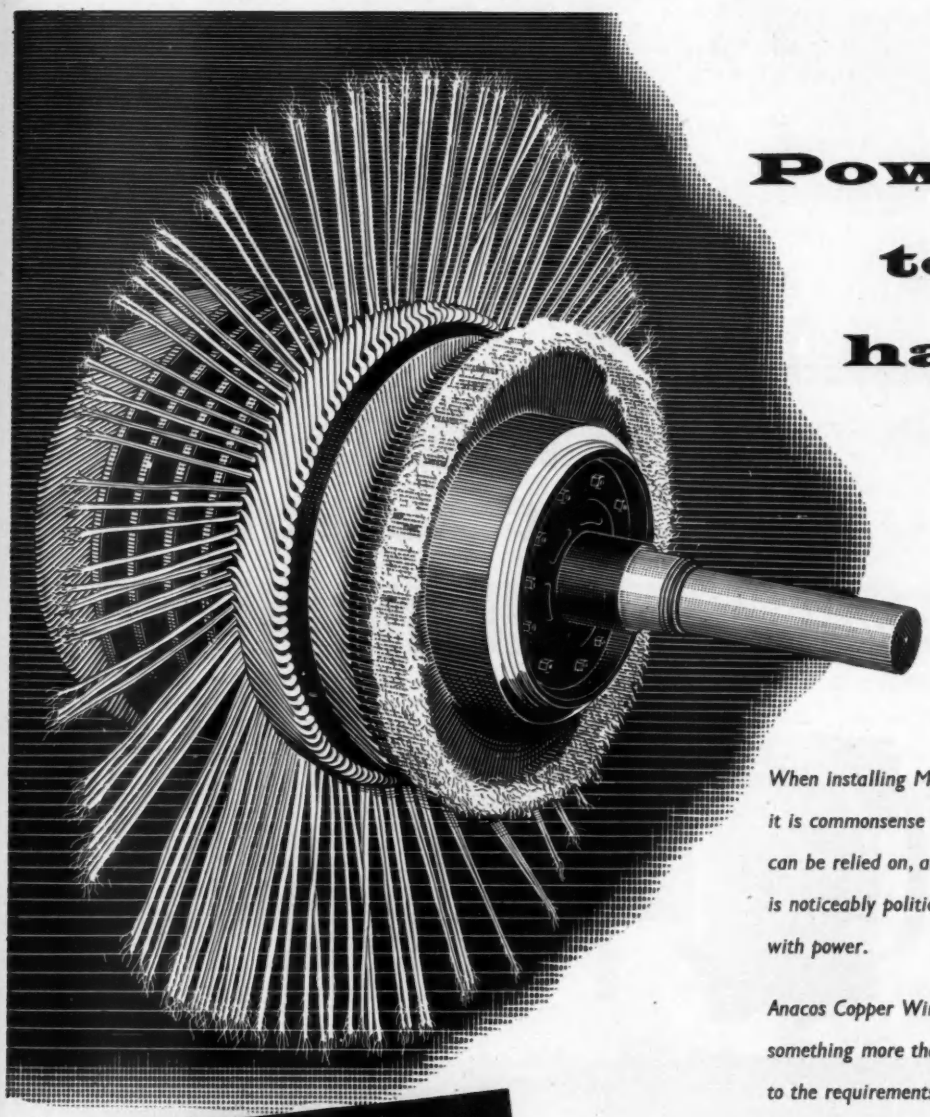

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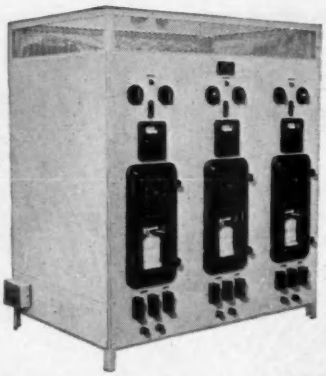

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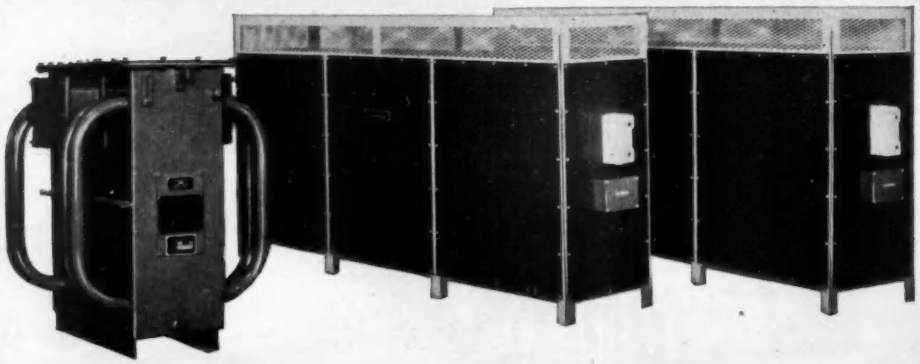

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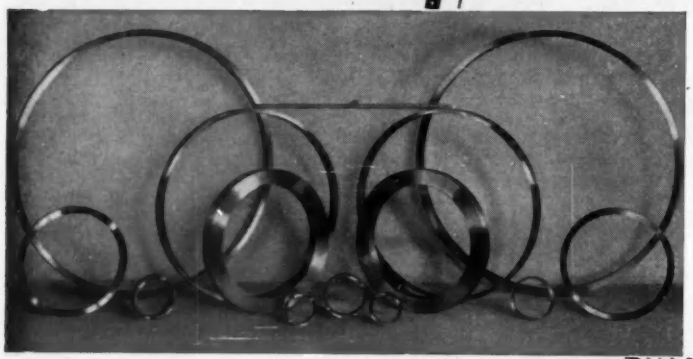

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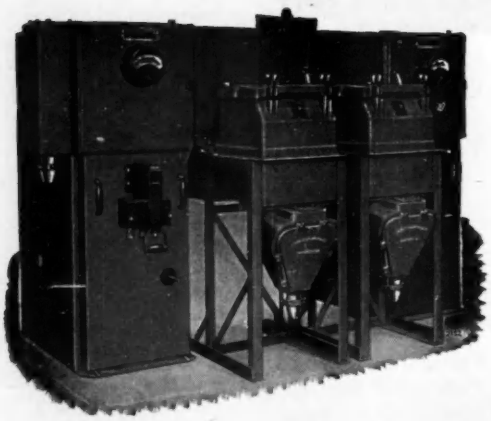

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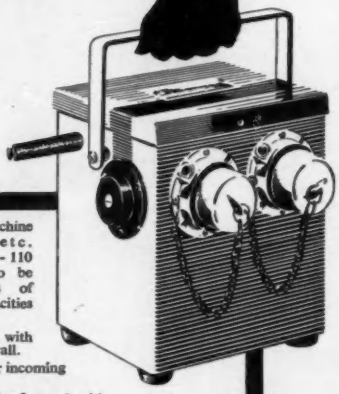

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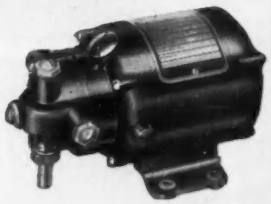

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600	10 oz. in.	37.5	4 lb. in.
300	16 oz. in.	25	4 lb. in.
150	24 oz. in.	18.8	4 lb. in.
100	32 oz. in.	12.5	4 lb. in.
75	36 oz. in.	9.4	4 lb. in.
50	3 lb. in.	6.25	4 lb. in.

SHADED-POLE INDUCTION GEARED MOTOR—Type 'FA'

R.P.M.	TORQUE	R.P.M.	TORQUE
216	4 oz. in.	13.5	24 oz. in.
108	7 oz. in.	9	30 oz. in.
54	10 oz. in.	6.7	35 oz. in.
36	12 oz. in.	4.5	44 oz. in.
27	15 oz. in.	3.35	3 lb. in.
18	20 oz. in.	2.25	4 lb. in.

VARIABLE SPEED GEARED MOTOR—Type 'KQ'

R.P.M.	TORQUE	R.P.M.	TORQUE
200-600	9 oz. in.	12-37.5	4 lb. in.
100-300	16 oz. in.	8-22	4 lb. in.
50-150	20 oz. in.	6-16.5	4 lb. in.
32-100	32 oz. in.	4-11	4 lb. in.
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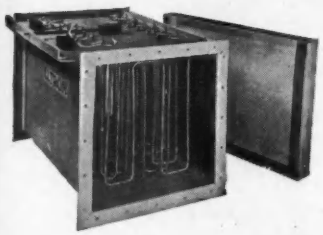

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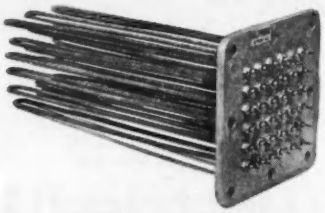

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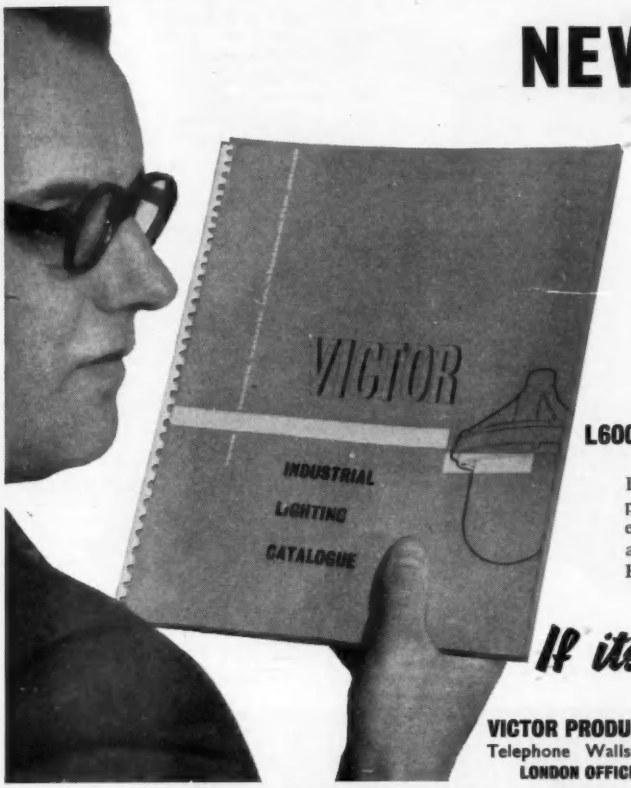

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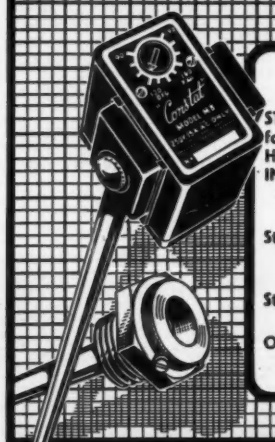

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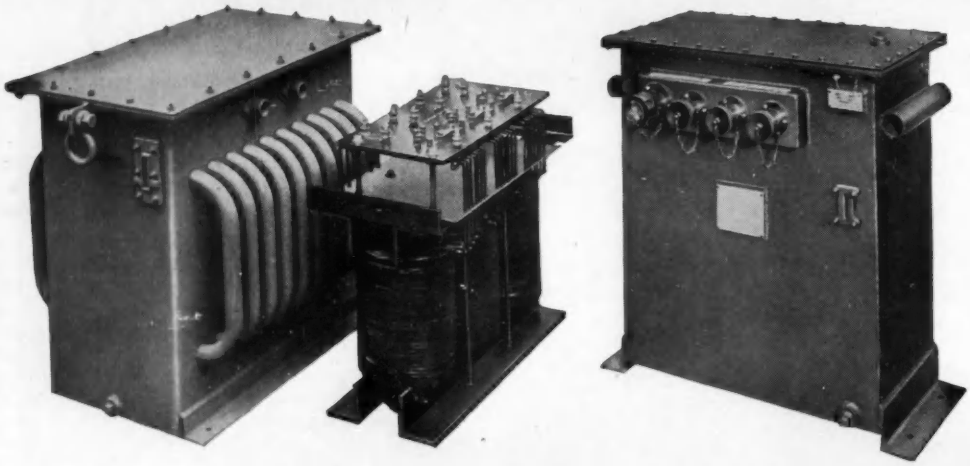

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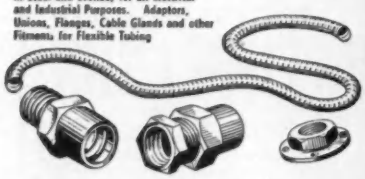

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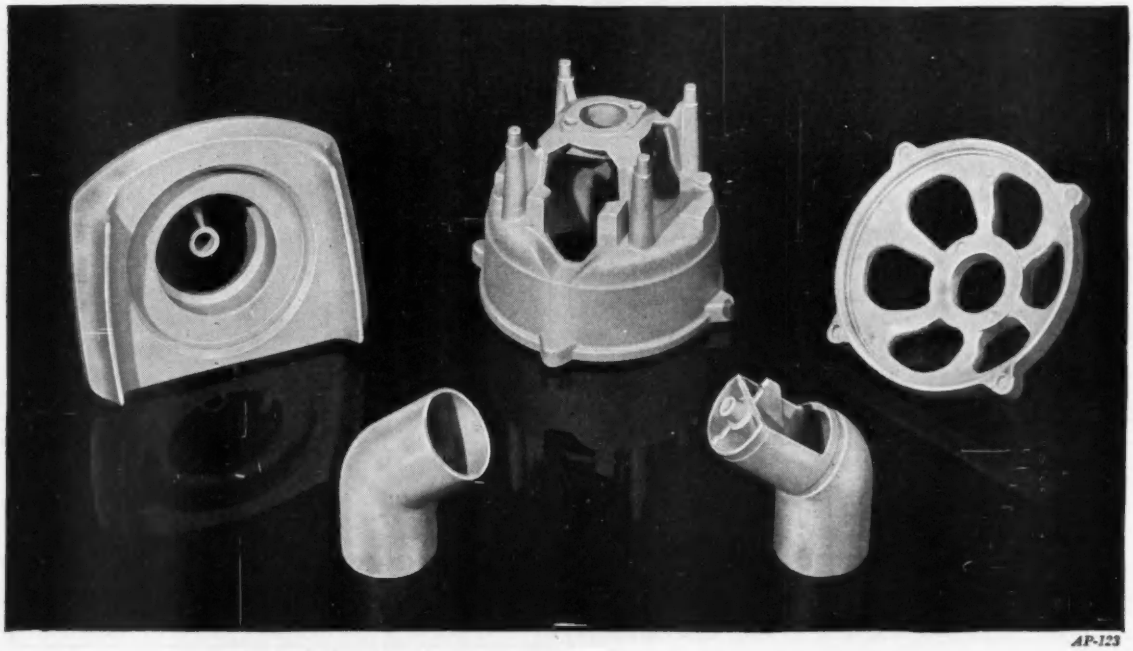

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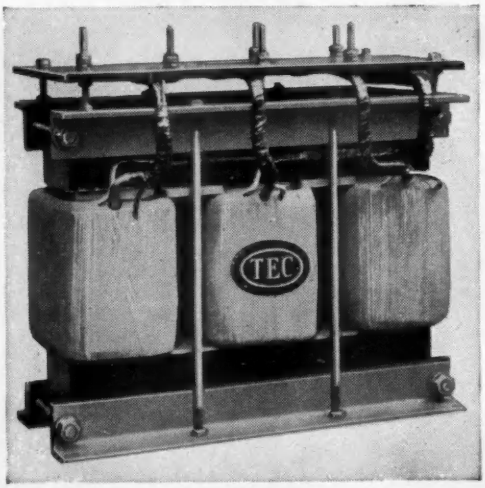

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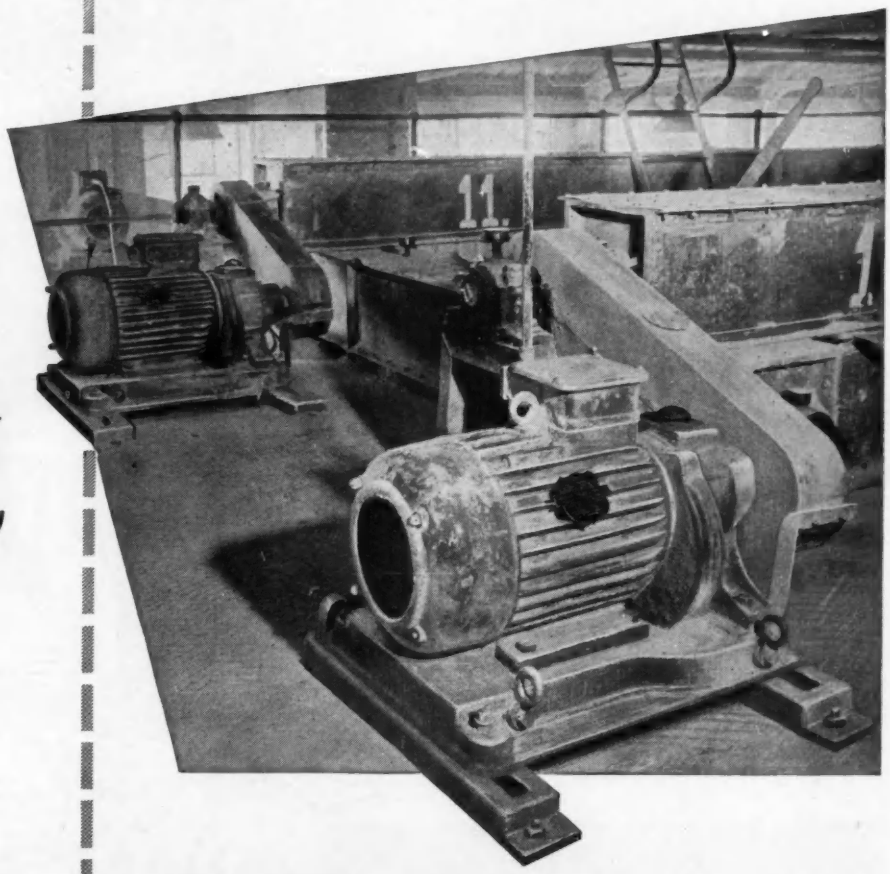

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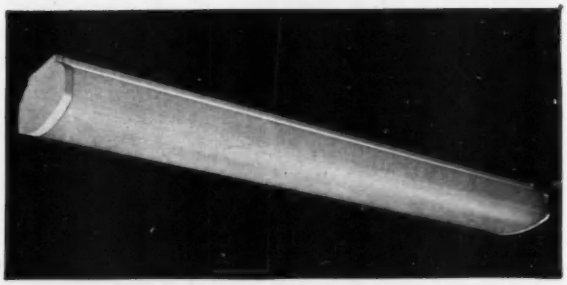

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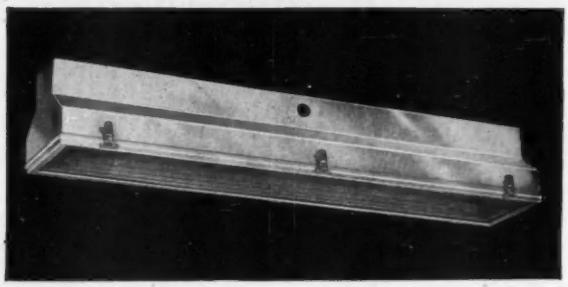

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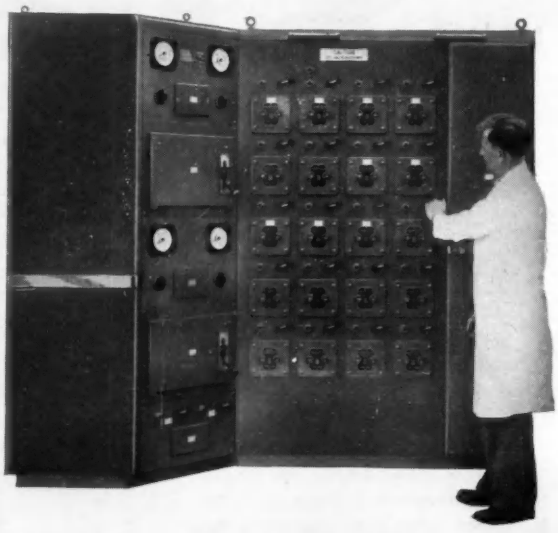

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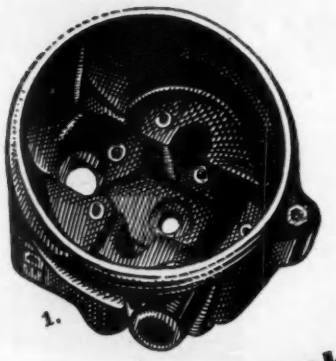

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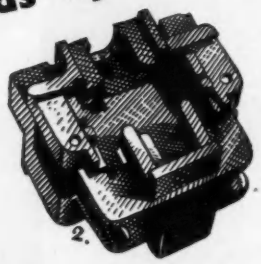

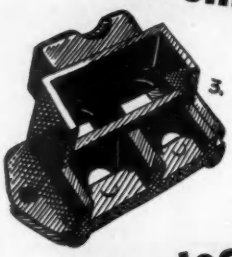

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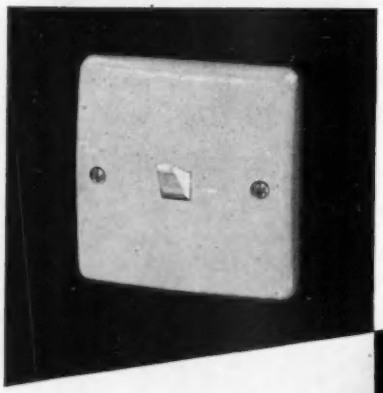

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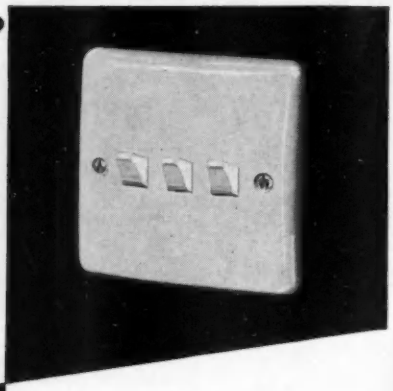

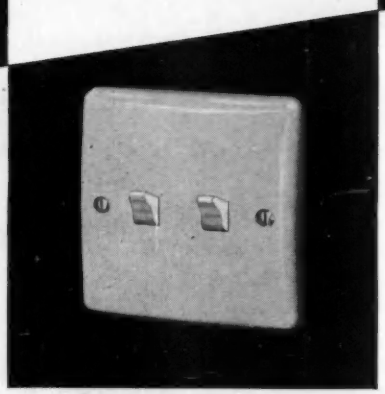

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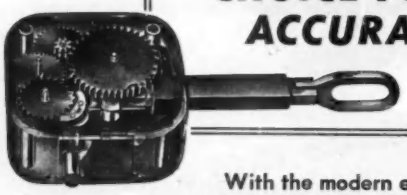

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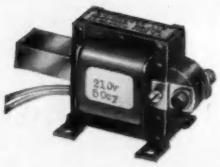

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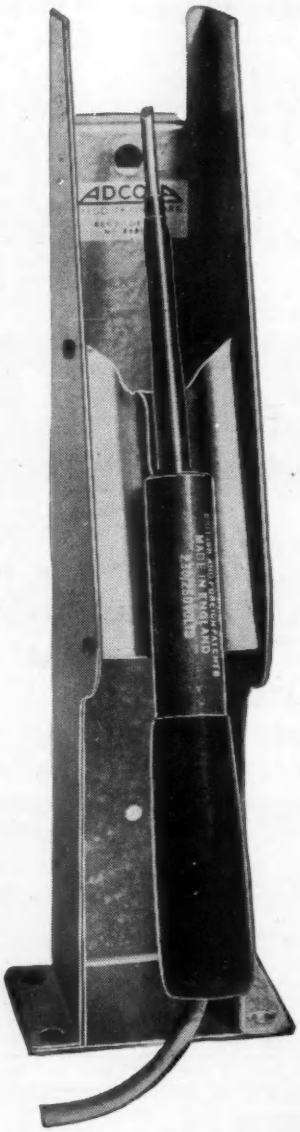

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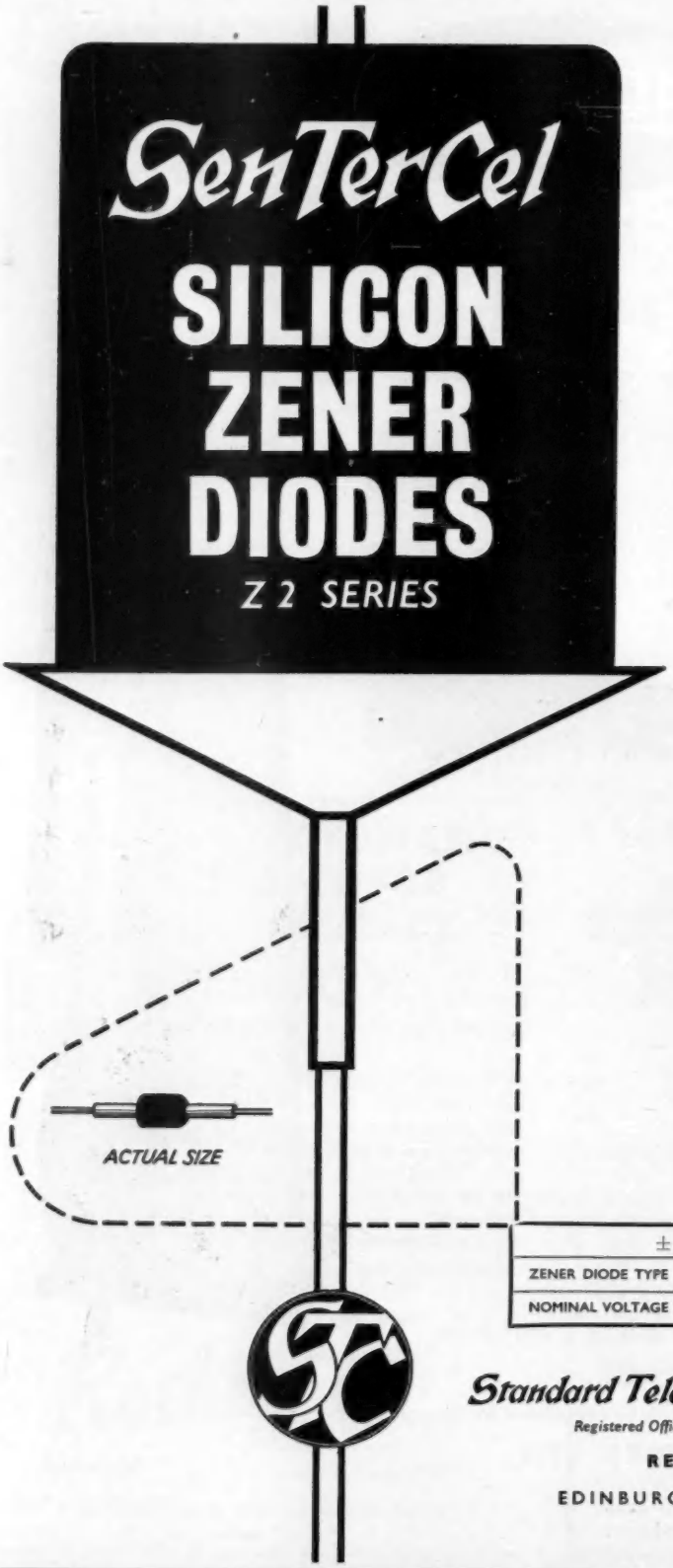

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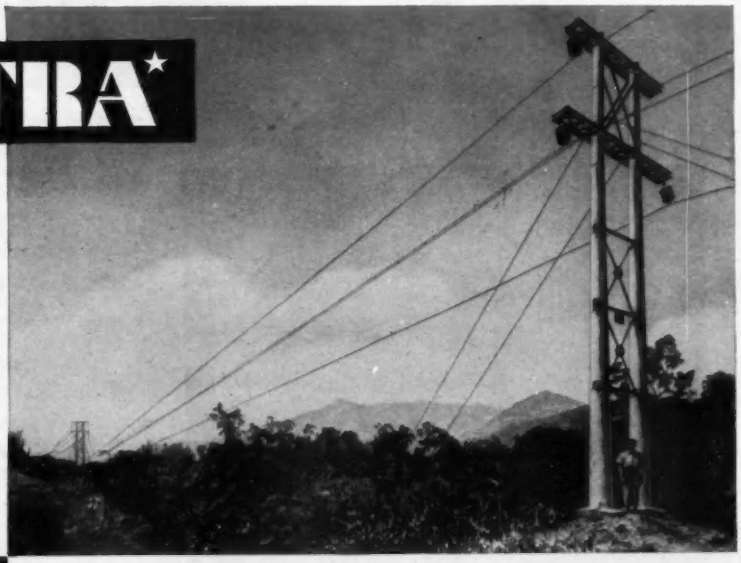

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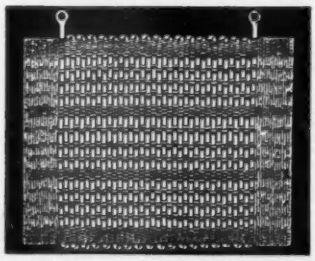

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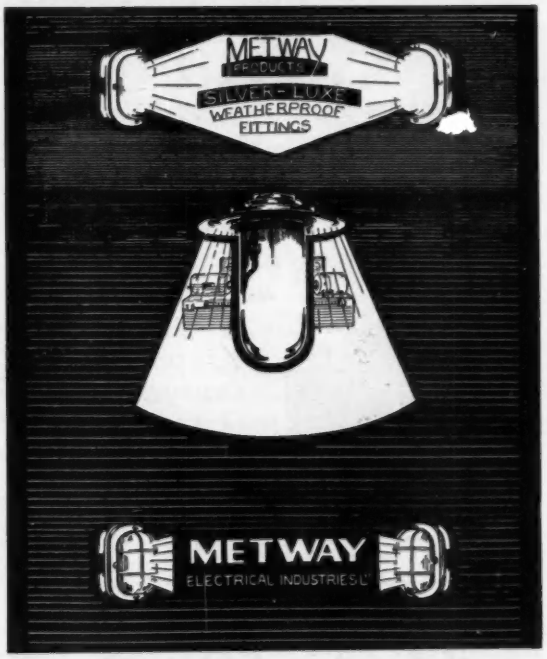

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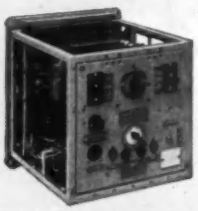

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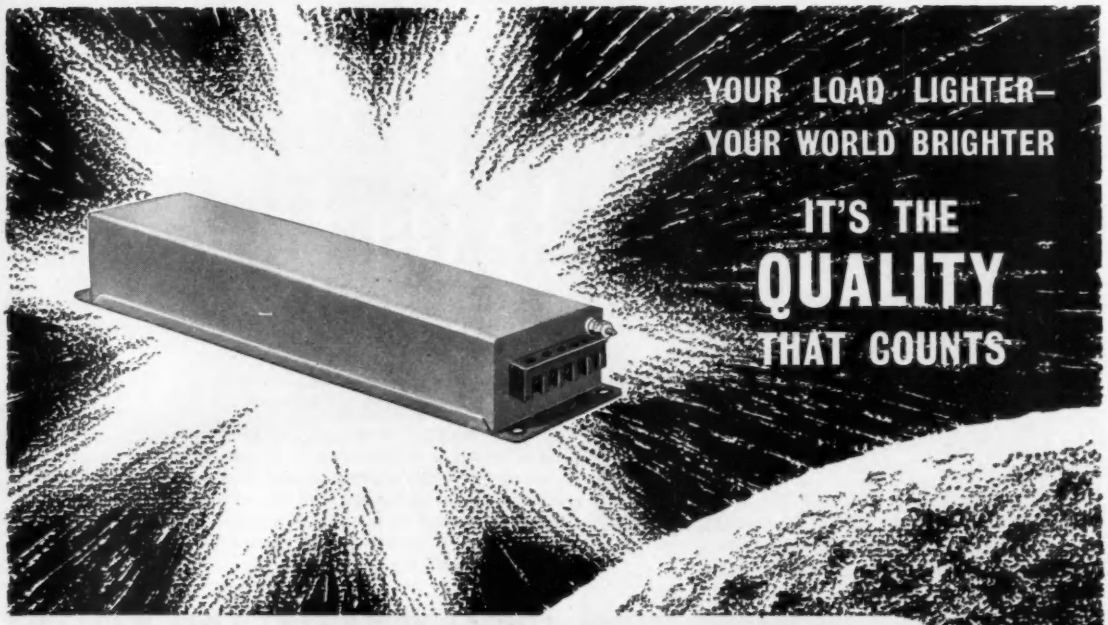

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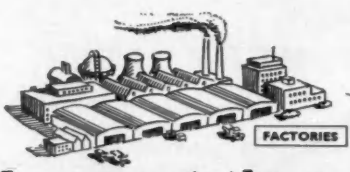

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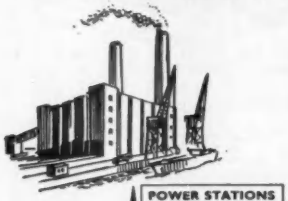

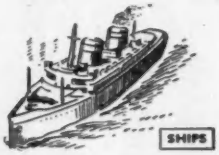

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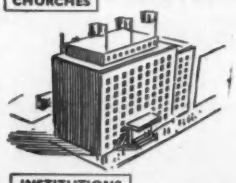

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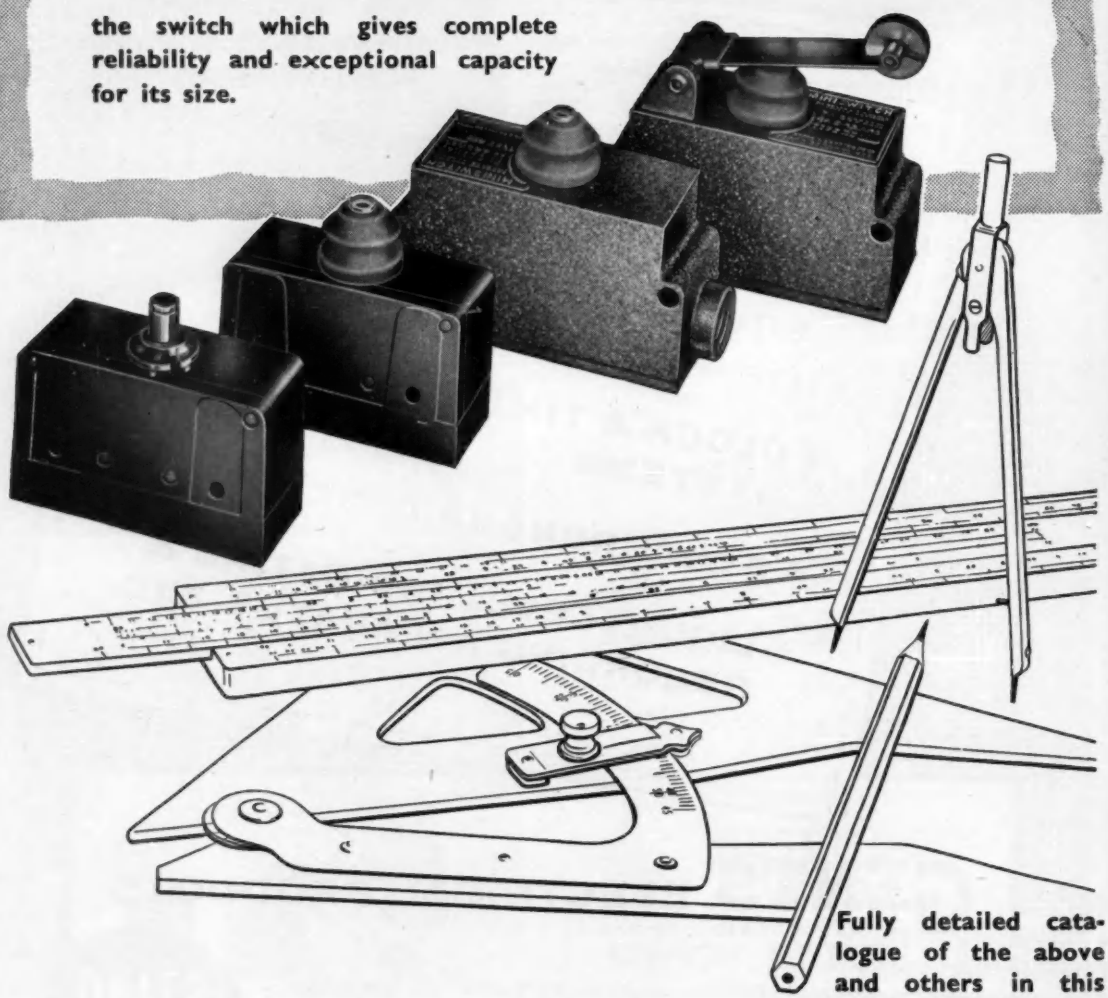

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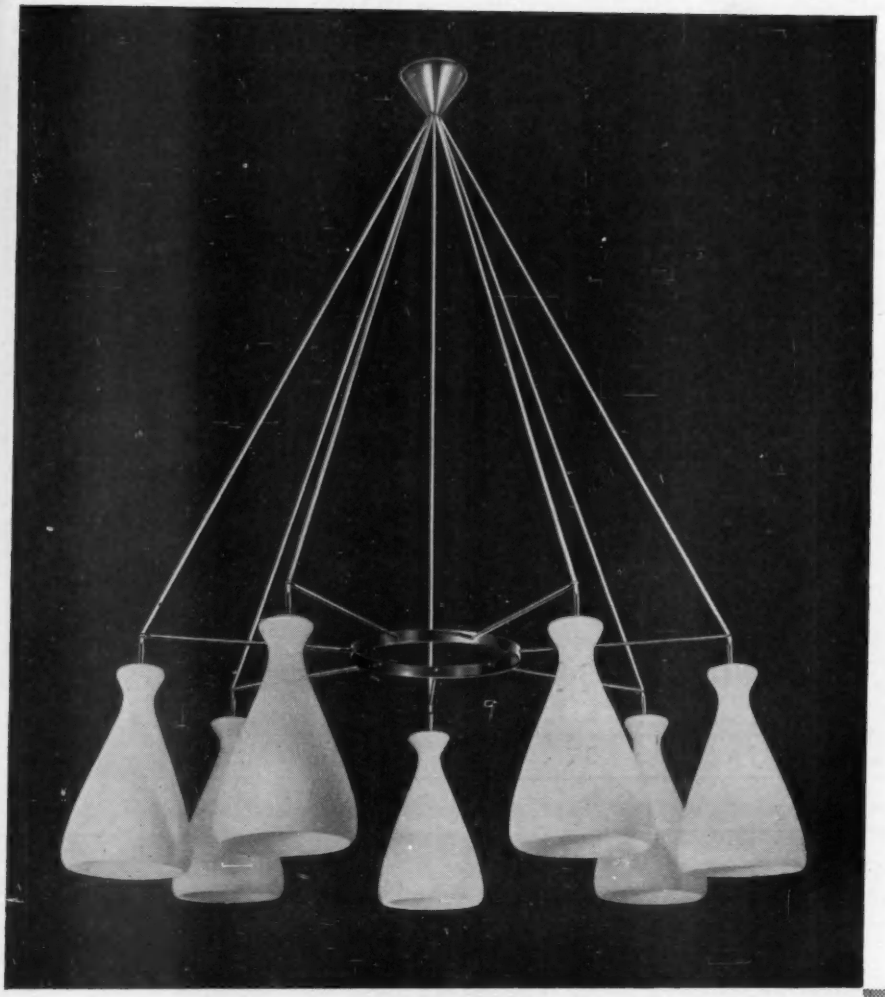

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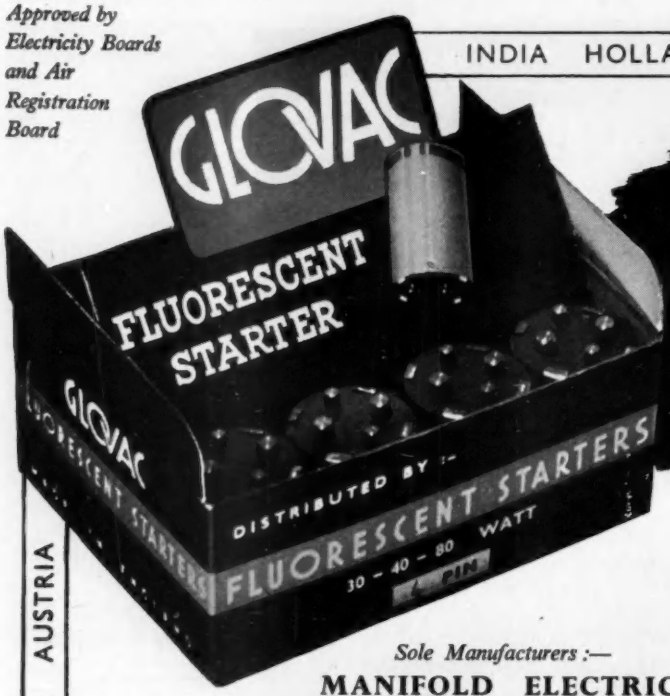

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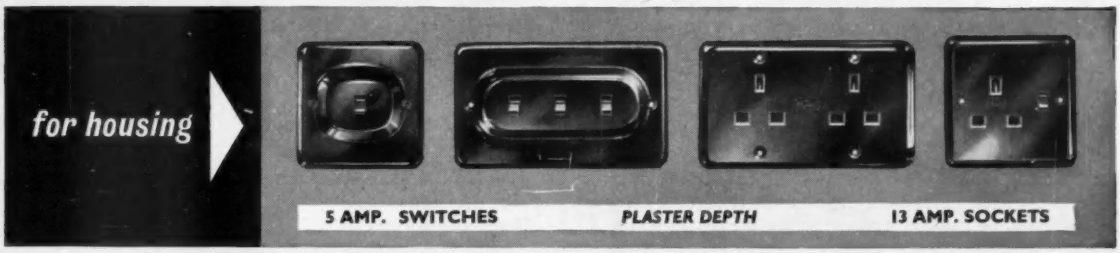

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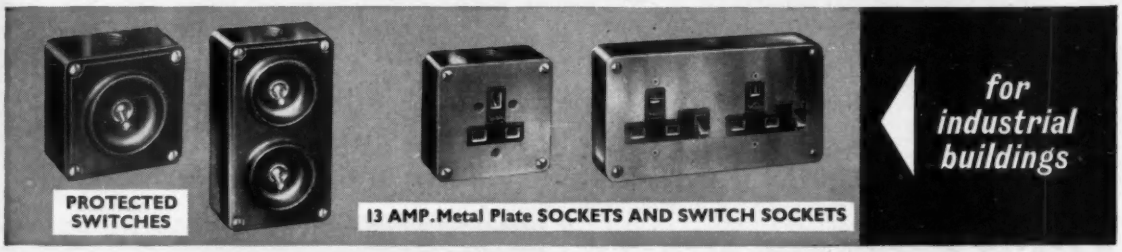

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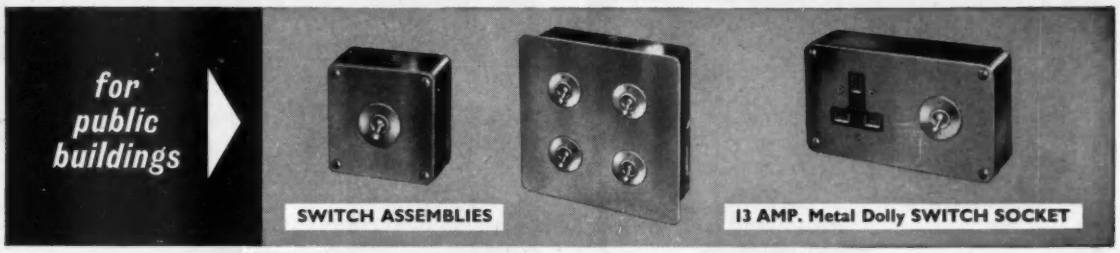

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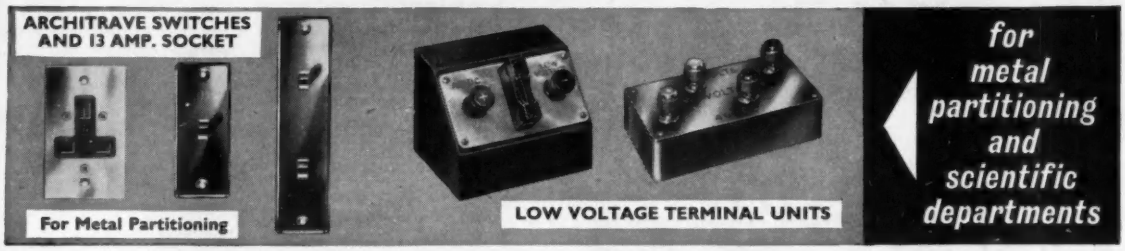
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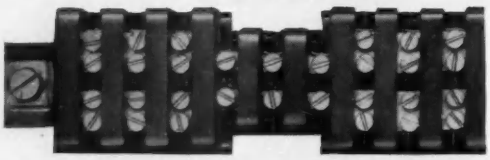

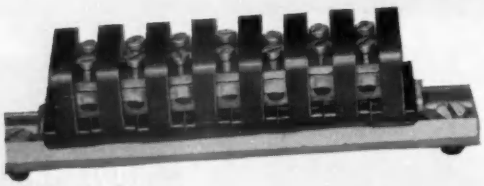

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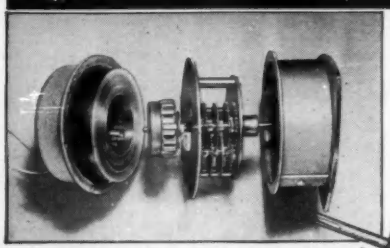

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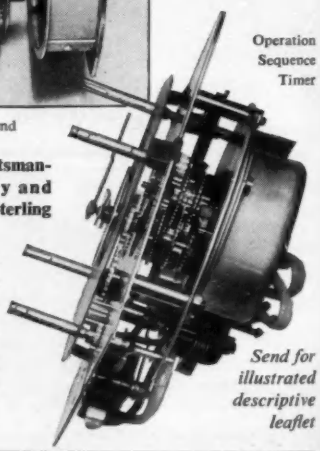

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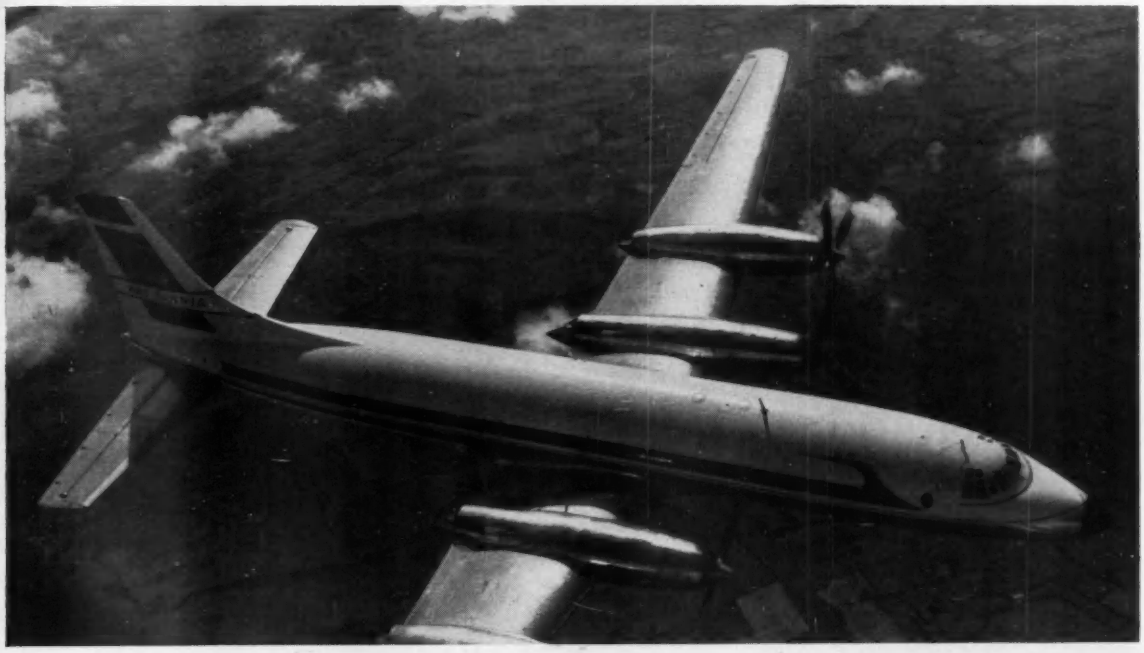

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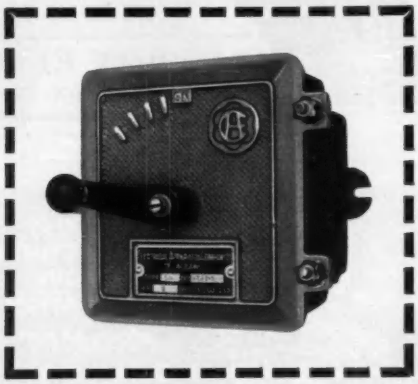

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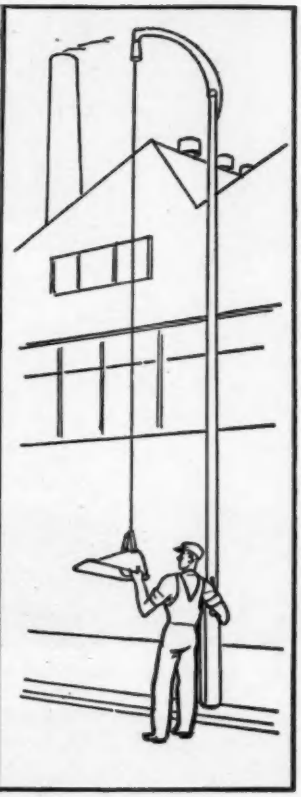

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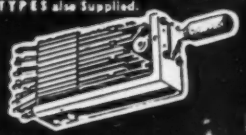

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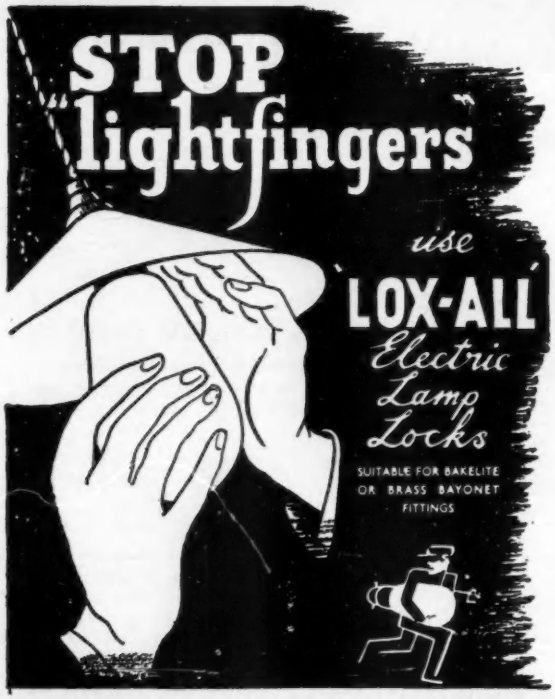

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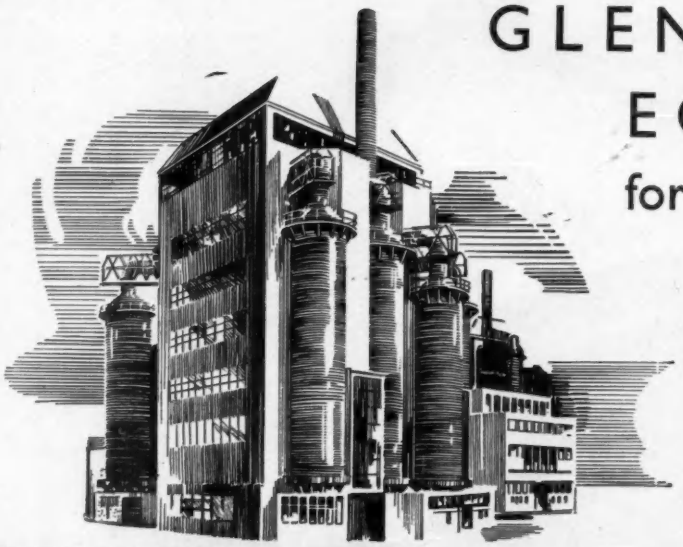

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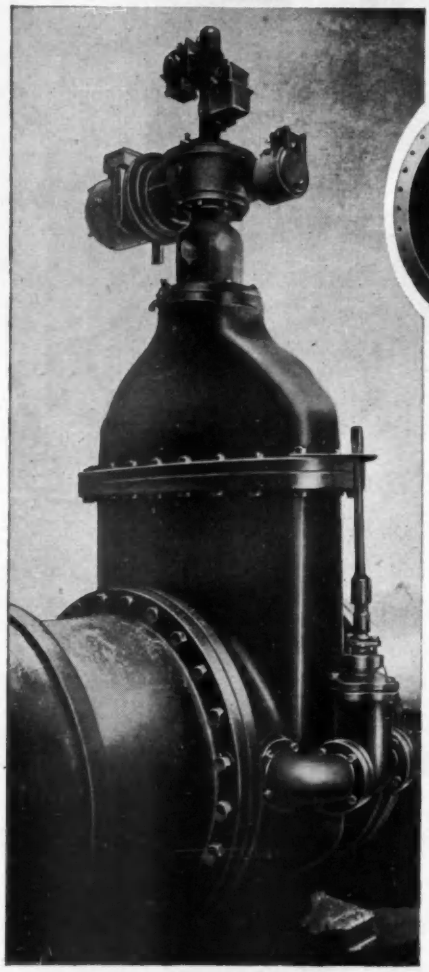

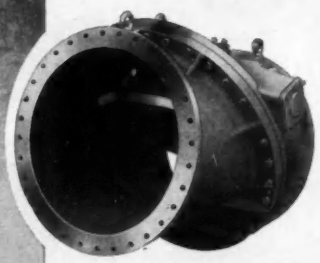

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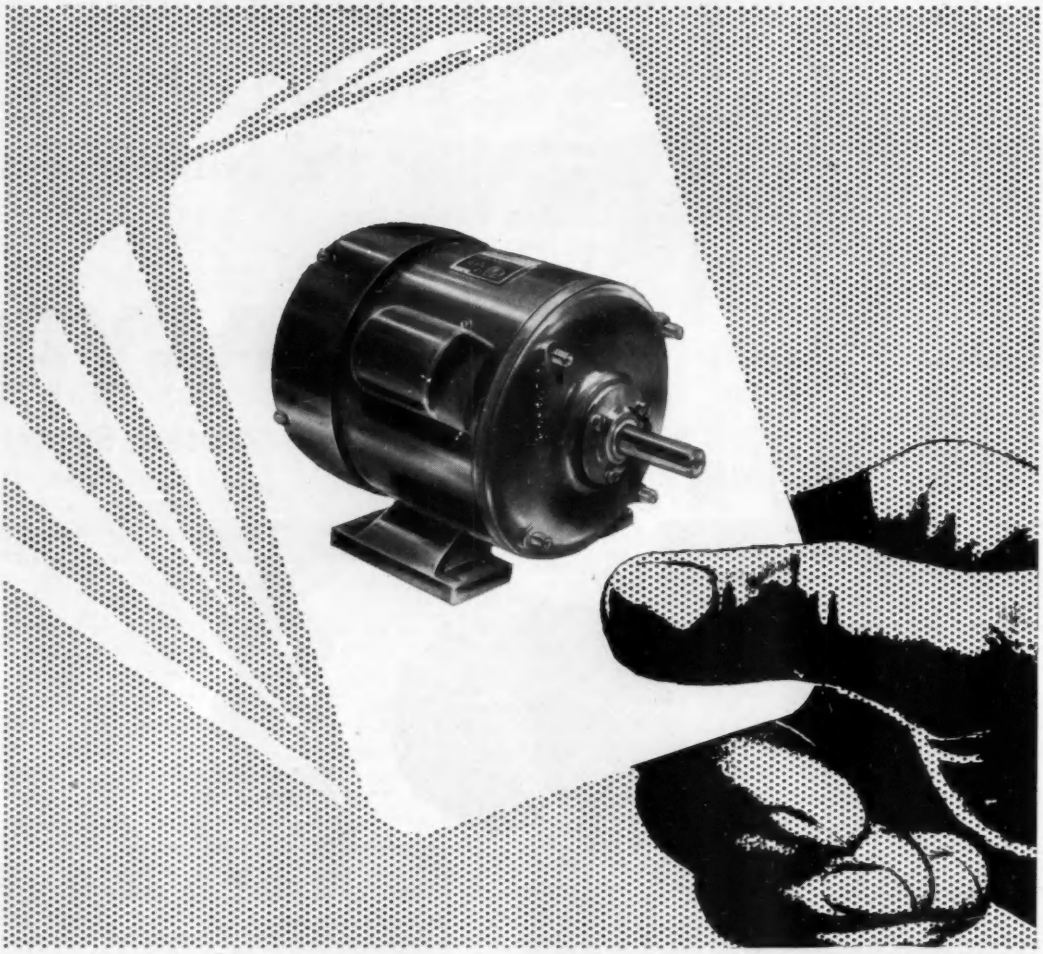

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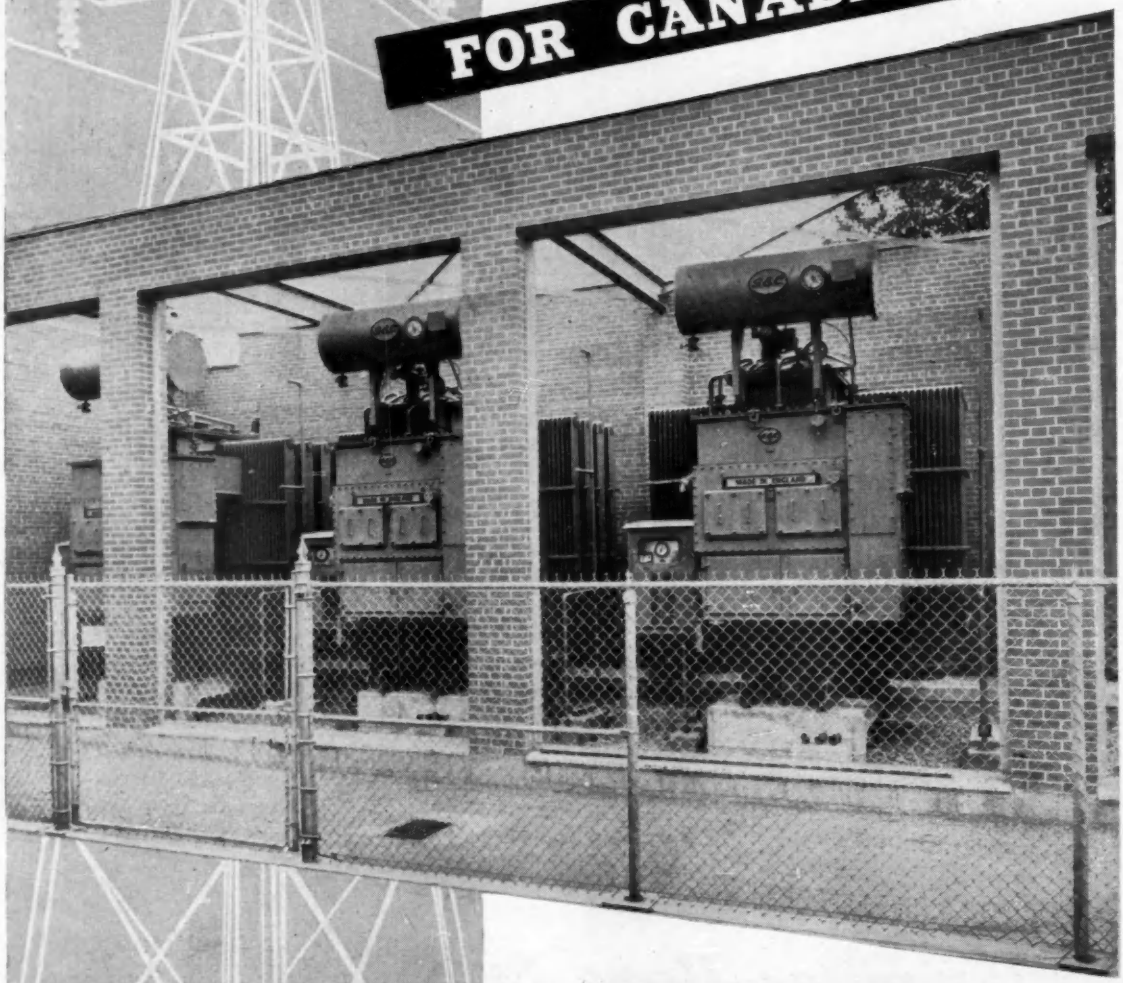

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OFFICIAL NOTICES, TENDERS, ETC.

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TENDERS are invited severally for the supply of columns, the supply and/or fixing of lanterns, gear and switches as follows.

Tenders may be submitted for the supply only of part or all of the goods required or only for the fixing.

Supply Street Lighting Columns of spun concrete to BSS 1308 approved by Council of Industrial Design and with polished finish.

Class A side entry:

Outreach	2 ft.	18
,,	4 ft.	142
,,	8 ft.	22

Class B top entry:

Nil Outreach	.....	130

Lanterns, medium angle beam to BSS 1788 and control gear without lamps.

140-w. Sodium enclosed, internal control gear/external gear, 160 sets.

400-w.MA/V for horizontal burning with deflector, with choke and capacitor, 22 sets.

45/60-w. Sodium enclosed, internal/external gear, 140 sets.

Clock switches, synchronous solar compensated midnight tappet.

Fixing of 182 Lanterns on Class A columns and 140 on Class B wiring through and fixing gear and time-switch.

Further details may be obtained from the office of the City Surveyor, City Hall, Cardiff.

The Council does not bind itself to accept the lowest or any tender and may wish to accpet part only of a tender. Any conditions limiting the Corporation's powers to accept part only of a tender must be included with the tender.

Tenders will not be considered unless enclosed in a plain sealed envelope, endorsed "Tender for supply/erection of Street Lighting Equipment," addressed to the TOWN CLERK at the City Hall, Cardiff, to be received by REGISTERED POST not later than Monday, 17th March, 1958.

The envelope must not bear the name of or any mark indicating the identity of the tenderer.

S. TAPPER-JONES,
Town Clerk.

City Hall,
Cardiff.
21st February, 1958. 2564

BOROUGH OF FAVERSHAM

Supply and Erection of Group A Lighting Equipment

TENDERS are invited for the supply, delivery and erection of 88 Lanterns and Fittings for 140-watt Sodium Discharge Lamps, together with pre-stressed concrete columns, brackets and other equipment.

Specification, bills of quantities and form of tender may be obtained from the Borough Surveyor, Municipal Offices, Faversham, on payment of £2, which will be refunded on receipt of a bona fide tender.

Tenders to be received by noon on Thursday, 20th March, 1958.

F. G. BISHOP,
Town Clerk

Municipal Offices,
Faversham.
24th February, 1958. 2592

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

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Cabling, Electric Lighting and Small Power Services for Shin Diversion Weir

TENDERS are invited for the cabling, electric lighting and small power services at Shin Diversion Weir Power Station, Sutherland.

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Shire Hall, Durham. 2563

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Service is terminable at any time on four months' notice by employee. A pension, which may, at the employee's option, be commuted for a lump sum payment, is payable at termination of service of not less than three years' duration. Value of commuted pension and lump sum leave payment payable if service were terminated after three years of first tour of service would total, at present rates of pay, between £1,467 (single man with three years' service) and £2,081 (married man with four years' service) according to marital status and length of service.

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Preference will be given to candidates with experience in the management of a large, modern workshop or, alternatively, with experience in repairing electrical installations, plant and electrical equipment aboard ocean-going vessels.

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CITY OF BIRMINGHAM EDUCATION COMMITTEE

Posts in Technical Colleges

APPLICATIONS are invited for the following posts in Technical Colleges, to commence duty on 1st September next. Application forms (separate for each post) and further details may be obtained from the Principal at the College concerned (stamped addressed envelope) and should be returned to him within 14 days of the appearance of this advertisement.

Salary scales in accordance with the Burnham (Further Education) Report, 1956:—

Lecturer: £1,200 × £30 to £1,350.

Candidates may be granted additional increments above the minimum and up to the maximum of the above scale in accordance with their industrial, professional or research experience as approved by the Authority as of equivalent standard.

Assistant Grade A, Man: £475 × £25 to £900.

Assistant Grade A, Woman: £430-£720 plus equal pay increments.

Candidates may be granted additional increments above the minimum of the above scale for time spent in industry, commerce, professional work or research. There are also additions to the scale for a degree or equivalent professional qualifications.

Aston Technical College, Whitehead Road, Birmingham, 6.

Principal:
D. D. Stockley, B.Sc., M.I.Mech.E.

DEPARTMENT OF ELECTRICAL ENGINEERING AND ENGINEERING MATHEMATICS.

LECTURER for Electrical Engineering and Engineering Mathematics up to H.N.C. standard. Should hold degree or equivalent, and have had teaching and industrial experience.

Handsworth Technical College, Golds Hill Road, Birmingham, 21.

Principal: H. Marshall, B.Sc., A.M.I.Mech.E., A.M.I.P.E.

ASSISTANT GRADE A in the Department of Electrical Engineering and Mathematics to teach elementary Mathematics and Physics.

Garretts Green Technical College, Garretts Green Lane, Birmingham, 33.

Principal:
B. C. Whitehouse, B.Sc., A.R.I.C.

DEPARTMENT OF ELECTRICAL ENGINEERING.

LECTURER in Electrical Engineering to supervise the Telecommunications and Radio Servicing classes in the department. May be required to teach in the National Certificate courses. Applicants should have graduate or equivalent qualifications and should have had industrial and teaching experience. The successful candidate for this post will be required to take up duties as soon as possible after 1st April, 1958.

Erdington Technical College, Edwards Road, Birmingham, 24.

Principal: G. Greasley, D.I.C., M.I.E.E., A.M.I.Mech.E.

THREE ASSISTANTS, GRADE A. One post is with special reference to Pre-Senior teaching; the other two with reference to the teaching of workshop technology and engineering drawing.

E. L. RUSSELL,
Chief Education Officer.

2560

***Situations Vacant** (continued)*

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT ENGINEER,
Guildford District.

Salary £740 × £15 to £785 per annum under N.J.B. Class E, Grade 9. Superannuable.

Applicants should hold Higher National Certificate in Electrical Engineering or its equivalent and have had practical experience in construction, operation and maintenance of underground and overhead distribution systems.

Applications, naming two referees, on forms from W. E. Affleck, M.I.E.E., M.Inst.F., Guildford Manager, SEEBOARD, 99, High Street, Guildford, Surrey, by 12th March, 1958.

GENERAL ASSISTANT ENGINEER,
Dover District.

Salary £685 × £15 to £730 p.a. under N.J.B. Class E, Grade 10. Superannuable.

Applicants should possess the Higher National Certificate in Electrical Engineering or equivalent qualification and must be experienced in the construction, operation and maintenance of overhead and underground distribution systems up to 11 kV. The appointment will involve standby duty.

Applications, naming 2 referees, to R. G. Widgery, A.M.I.E.E., District Manager, SEEBOARD, Ladywell, Dover, by 12th March, 1958.

ASSISTANT DISTRICT ENGINEER,
Woking District.

Class F, Grade 7, under N.J.B. Agreement. Salary £885 to £930 per annum. Superannuable.

Applicants, who should have had a good general education and be technically trained up to H.N.C. standard, must have had practical training and experience in general distribution work on systems up to 11 kV, and be capable of organising and supervising the work of a full construction and maintenance programme. Ability to plan and prepare schemes for mains extensions would be an advantage.

Applications, naming two referees, on forms from E. Peel, A.M.I.E.E., Woking Manager, SEEBOARD, 4, Chobham Road, Woking, by 12th March, 1958.

ASSISTANT DISTRICT ENGINEER,
Woking District.

Class F, Grade 9 under N.J.B. Agreement. Salary £790 to £835 per annum. Superannuable.

Applicants of good general education should have technical training up to Higher National Certificate standard, with practical experience of general distribution work and be capable of giving assistance in planning, construction, or maintenance work.

Applications, naming two referees, on forms from E. Peel, A.M.I.E.E., Woking Manager, SEEBOARD, 4, Chobham Road, Woking, by 12th March, 1958.

FOURTH ASSISTANT ENGINEER
(Operation and Maintenance),
Surrey Sub-Area Headquarters, Dorking.

Annual salary £790 - £835 under N.J.B. Class K, Grade 13. Superannuable.

Applicants of at least H.N.C. standard should have had a sound training in electrical distribution. Duties will chiefly consist of assisting in plant maintenance and the testing and commissioning of system protection. A knowledge of, or interest in, the latter would be an advantage.

Applications, naming two referees, on forms from C. W. Hughes, B.Sc., M.I.E.E., Surrey Manager, SEEBOARD, Rough Rew, Ridgeway Road, Dorking, Surrey, by 12th March, 1958.

SUB-AREA COMMERCIAL OFFICER,
Surrey Sub-Area, Dorking, Surrey.

Salary £1,900-£2,100 in accordance with N.J.M. Class C, Grade 5.

Candidates should preferably be Corporate Members of the Institution of Electrical Engineers and must have had wide experience of commercial work in both urban and rural areas.

Application forms, together with some information about the Surrey Sub-Area, may be obtained from C. W. Hughes, B.Sc., M.I.E.E., Surrey Manager, SEEBOARD, Rough Rew, Ridgeway Road, Dorking, Surrey. Applications to be submitted by 12th March, 1958.

FIRST ASSISTANT DISTRICT ENGINEER,
Maidstone District.

Salary £995 × £20 to £1,055 per annum under N.J.B. Class F, Grade 5. Superannuable.

Applicants should be of Higher National Certificate standard and preferably Corporate Members of the I.E.E. They should have had responsible practice in the planning, construction, operation and maintenance of underground and overhead systems up to 33 kV in both urban and rural areas. The ability to control staff and organise work is essential.

Applications, naming two referees, to C. E. Hollingworth, B.Eng., M.I.E.E., District Manager, SEEBOARD, Electricity Works, Fairmeadow, Maidstone, Kent, by 12th March, 1958.

ASSISTANT DISTRICT ENGINEER,
Dorking and Epsom District.

Annual salary under N.J.B. Class F, Grade 9, £790 × £15 to £835. Superannuable.

Applicants should possess the Higher National Certificate in Electrical Engineering and be experienced in distribution networks as above.

Applications, naming two referees, on forms from C. L. B. White, Dorking and Epsom Manager, SEEBOARD, 56, South Street, Dorking, Surrey, by 12th March, 1958.

G. WRAY,
Deputy Secretary.
2573

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. an advantage.

ASSISTANT SHIFT CHARGE ENGINEER,
BRUNSWICK WHARF
POWER STATION
(Vacancy No. 58/121).

Sound practical and technical training necessary in electrical and mechanical engineering with practical experience in efficient operation of power station plant. Salary Class K, Grade 9 = £1,045 plus £99 10s. shift p.a.

ASSISTANT ENGINEER (Operation),
FULHAM POWER STATION
(Vacancy No. 58/122).

Operational experience in large modern power station with sound knowledge of safety rules. Salary Class K, Grade 10 = £985 plus £93 10s. shift p.a.

ASSISTANT ENGINEER (Electrical Test),
FULHAM POWER STATION
(Vacancy No. 58/123).

Knowledge of testing and routine maintenance of power station electrical equipment, including generators, switchgear, transformers, motors and protective equipment. Salary Class K, Grade 15 = £725 p.a.

ASSISTANT ENGINEER (Technical),
TAYLORS LANE POWER STATION
(Vacancy No. 58/124).

Assistant in general power station technical matters. Salary Class F, Grade 14 = £580 per annum.

FIRST ASSISTANT STATION CHEMIST,
WOOLWICH POWER STATION
(Vacancy No. 58/125).

Candidates should be qualified to H.N.C. or equivalent and experienced in examination of coal, oil and water. Power station plant experience necessary. Salary Class H, Grade 9 = £935 p.a.

ASSISTANT MAINTENANCE
ENGINEER (Mechanical),
WOOLWICH POWER STATION
(Vacancy No. 58/126).

Sound engineering training with experience of power station plant maintenance and control of staff. Salary Class H, Grade 8 = £985 p.a.

FOURTH ASSISTANT ENGINEER,
UTILISATION RESEARCH,
TECHNICAL DEPARTMENT,
95, PARK STREET, S.E.1
(Vacancy No. 58/127).

To deal with testing and maintenance of several hundred portable recording instruments (mainly polyphase meters with printing mechanism) and instrument transformers in test room, on site, and possibly for short periods out of London. Salary Class AX/EX, Grade 8 = £750-£985 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 10th March, 1958. 2530

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

SENIOR DRAUGHTSMAN,
TRANSMISSION DEPARTMENT,
DIVISIONAL HEADQUARTERS
(Vacancy No. 29/58/ER).

The work is associated with H.V. electrical substations, etc., and experience on H.V. overhead lines or underground cable systems will be an advantage but is not essential.

Salary will be in accordance with Grade 5 (£760-£860 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 5th March, 1958.

GENERAL ASSISTANT
ENGINEER (Chemist),
LINCOLN POWER STATION
(Vacancy No. 18/58/ER).

Candidates must have had a sound technical training and some previous experience in an industrial laboratory, and should hold the Ordinary National Certificate in Chemistry.

The duties will include the routine analysis of coal, water and oil, but the post offers opportunities of gaining general experience in the chemical control of power station operation.

Salary will be within the range £540-£680 per annum, in accordance with the National Joint Board Agreement.

Closing date for receipt of applications, 12th March, 1958.

PLANT SHIFT CONTROL ENGINEER,
DRAKELOW POWER STATION
(Vacancy No. 30/58/ER).

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience.

Technical qualifications to Higher National standard desirable.

Conditions of service and salary will be in accordance with Class J, Grade 10 (£885-£930 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 12th March, 1958.

SHIFT CHARGE ENGINEER,
WARWICK POWER STATION
(Vacancy No. 31/58/ER).

Applications are invited from qualified engineers for the position of Shift Charge Engineer at Warwick Power Station.

Applicants should have had experience in the operation of steam turbine and boiler plant.

Salary in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 12th March, 1958.

THIRD ASSISTANT ENGINEER.
TESTING & EFFICIENCY SECTION,
GENERATION OPERATION DEPT.,
DIVISIONAL HEADQUARTERS
(Vacancy No. 34/58/ER).

Applicants should have a good general and technical education to Higher National Certificate standard, workshop experience, and a thorough knowledge and experience of operation and testing of modern steam generating plant, including instrumentation.

Preference will be given to candidates possessing an engineering degree, Membership of the Institution of Electrical Engineers or the Institution of Mechanical Engineers, and a specialised knowledge of boilers and associated plant.

Salary will be in accordance with Schedule B, Class AX/EX, Grade 5 (£1,055-£1,320 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 12th March, 1958.

These appointments will be pensionable under the terms of the Staff Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.
19th February, 1958. 2528

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following positions:—

Head Office

SENIOR ASSISTANT ENGINEER (Tariffs).

Salary N.J.B. Class AX, Grade 1, £1,560 × £25 to £1,685 per annum, with further progression to £1,755 (Class CX).

The successful candidate will be responsible directly to the Assistant Chief Commercial Officer (Tariffs) and will be expected to undertake duties embracing all aspects of the work of the section. More particularly, he will be engaged in the branches relating to special terms for industrial and other large power consumers and the organisation and carrying out of utilisation and cost research on a progressive basis.

Applicants should have extensive engineering and commercial experience in the electricity supply industry and a sound appreciation of economics. A degree in engineering or Corporate Membership of the Institution of Electrical Engineers is highly desirable.

Applications on standard form AE6/ACT, obtainable from Establishments Officer, Electricity House, Colston Avenue, Bristol, 1, are returnable by 11th March, 1958.

Bristol Sub-Area

SURVEYOR/ENGINEERING DRAUGHTSMAN, BATH.

Salary N.J.B. Schedule D.6, £595-£715 per annum.

Duties include making of field surveys in connection with the erection of H.V. and L.V. mains; plotting results; preparation of profile drawings and schedules of materials for o/h and u/g construction work; preparation of engineering drawings and substation site and layout plans. Knowledge of overhead and underground line construction, surveying, drawing office experience, and the possession of a current driving licence are desirable.

Applications on standard form AE6/ACT, obtainable from Manager, Bristol Sub-Area, Electricity House, Colston Avenue, Bristol, 1, are returnable by 11th March, 1958.

Taunton Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER, BARNSTAPLE.

Salary according to Class D, Grade 7, £790 × £15 to £835 per annum of Schedule A of the N.J.B. agreement.

The successful candidate will be required to render general assistance in the Engineering Department. Duties will include assistance in the construction and operation of H.V. and L.V. substation equipment and overhead and underground mains, and participation in a rota of standby duty.

Applicants should possess as a minimum qualification the H.N.C. or equivalent.

Applications on standard form AE6/ACT, obtainable from Manager, Taunton Sub-Area, The Parade, Taunton, are returnable by 11th March, 1958.

Cornwall Sub-Area

SECOND ASSISTANT ENGINEER (METERS), DESIGNATE, CORNWALL SUB-AREA HEADQUARTERS.

Salary N.J.B. H.6, £1,065-£1,140 per annum.

Duties will include the organisation and supervision of the Class A Meter Testing Station at Sub-Area Headquarters, Pool, Redruth; the supervision of meter testing, repairs and maintenance of all meters and other metering equipment, including the routine changing and testing of meters used for recording supplies to consumers.

Candidates should have practical experience of the regulations and work entailed in connection with meter testing and maintenance in a meter testing station. Associate Membership of the Institution of Electrical Engineers, or equivalent qualifications, desirable.

Applications on standard form AE6/ACT, obtainable from Manager, Cornwall Sub-Area, Pool, Redruth, Cornwall, are returnable by 11th March, 1958. 2575

SOUTH WALES SWITCHGEAR LTD.

Blackwood, Mon.

have vacancies for DRAUGHTSMEN in the High-voltage Switchgear Contract and Diagram Sections of their Drawing Office.

Applications giving full particulars of experience, age and qualifications to the Personnel Manager. 2487

LINDSEY COUNTY COUNCIL

(a) TWO ENGINEERING ASSISTANTS, Grade A.P.T. II, £725/£845, for heating services. Candidates should hold the Higher National Certificate or Intermediate Examination I.H.V.E., and be capable of assisting in the design and preparation of heating and hot water schemes and specifications for school buildings.

(b) ONE ELECTRICAL ENGINEERING ASSISTANT, Grade A.P.T. II, £725/£845. Should be capable of preparing drawings in connection with electrical installations in schools. Higher National Certificate required.

In special circumstances consideration will be given to starting salary not more than two steps up the grade.

N.J.C. conditions of service. Canvassing will disqualify. Candidates must disclose in writing whether to their knowledge they are related to any member or senior officer of the Council.

Applications giving age, qualifications, experience, present salary, and the names of at least two persons to whom reference can be made, to be sent not later than 12th March to the County Architect, County Offices, Lincoln. 2566

SOUTH WALES SWITCHGEAR LIMITED

Blackwood, Mon.

WE invite applications from capable young men possessing drive and initiative for the following positions in our rapidly expanding organisation. Candidates should preferably possess a Higher National Certificate or equivalent qualification, but good experience in one or more of the following fields is considered to be of prime importance.

DESIGN DRAUGHTSMEN.

Experienced in the design of H.V. switchgear and associated equipment.

CONTRACTS DRAUGHTSMEN.

With experience in the application and layout of switchgear in one or more of the following fields: outdoor and indoor substations, power station and industrial switchgear, generator busbar trunking.

DIAGRAMS DRAUGHTSMEN.

Experienced in the layout and detail of protective and control systems, etc., covering all types of switchgear applications.

The vacancies occur in a modern factory, located in pleasant surroundings within easy access of Cardiff and Newport.

Applications, which will be treated in the strictest confidence, should be addressed to the

PERSONNEL MANAGER.

2503

SALES ENGINEERS

are required by old-established electric motor manufacturers for the following areas:—

i. West of England and South Wales.
ii. Midlands.
iii. Lancashire and Yorkshire.

These are new appointments arising out of expansion of the company's outside sales staff and provide scope for men who are keen to sell first-class products.

Candidates should have good knowledge of electric motors and generators and their applications, and should preferably hold a Higher National Certificate or equivalent qualification.

Salaries in accordance with experience and qualifications. The appointments will include entrance to the company's pension scheme.

Please write, giving full particulars, including education and technical training, to Personnel Manager, Small Electric Motors Ltd., Beckenham, Kent. 2534

WESTERN REGIONAL HOSPITAL BOARD, SCOTLAND

Assistant Engineers

APPLICATIONS are invited for two posts of ASSISTANT ENGINEER for electrical and heating duties respectively. Applicants should be Corporate Members of or have attained the technical standard of Corporate Members of the Institutions of Electrical Engineers or Heating and Ventilating Engineers respectively, and should have practical and theoretical experience of design, installation and operation and general maintenance, and should be capable of assisting in preparing specifications and estimates and advising generally on the classes of plant in their own particular field, viz.:—

(a) ELECTRICAL: Electrical installation, including heating, lighting and power, and

(b) HEATING: Heating, ventilating, hot water, air conditioning, refrigerating, sterilising and pipe work installations in large buildings, laundries, kitchens, etc.

Salary scale £700 × £25 (3) × £30 (1) × £35 (6) to £1,015. Starting salary may be above the minimum having regard to experience.

The successful applicants will be required to pass a medical examination, and all appointments are subject to a deduction at the rate of 6% for superannuation.

Applications giving particulars of qualifications and experience, together with the names of three referees, should be lodged with the Secretary, Western Regional Hospital Board, 64, West Regent Street, Glasgow, C.2, not later than 8th March, 1958. 2516

MIDLANDS ELECTRICITY BOARD

North Staffs Sub-Area

FOURTH ASSISTANT ENGINEER (Planning) (Headquarters). Applicants should have had general distribution experience, and duties will include detailed design of major substations, specifications for substation equipment planning and estimating for systems extensions. Salary £790/£835 per annum (N.J.B. K.13). The Sub-Area classification may shortly be raised to L.

Apply by letter within 14 days, stating age, qualifications, experience, present salary and position, to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

Worcester and District Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER (Worcester District). Applicants should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. Salary £885/£930 per annum (N.J.B. Grade F.7).

THIRD ASSISTANT DISTRICT ENGINEER (Kidderminster District). Applicants should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. distribution systems. Technical qualifications desirable. Salary £790/£835 per annum (N.J.B. Grade F.9).

Apply by letter within 14 days, stating age, experience, present salary and position, to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary. 2576

WIGAN AND DISTRICT MINING AND TECHNICAL COLLEGE

APPLICATIONS are invited for a post as ASSISTANT GRADE B in ELECTRICAL ENGINEERING. Duties will commence as soon as possible.

Candidates should have good academic qualifications and have practical experience in industry. Teaching experience would be an advantage. Salary in accordance with the Burnham Technical Scale for Assistants Grade B (£650 by £25 to £1,025) with additions for qualifications and experience.

Further particulars and application form will be sent by the undersigned. Applications should be sent in to reach the undersigned not later than Friday, 7th March, 1958.

E. C. SMITH,
Principal.
14th February, 1958. 2502

Situations Vacant (continued)

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant Engineer (Shift Operation) Northamptonshire Sub-Area

APPLICATIONS are invited from suitably qualified and experienced engineers for the position of FOURTH ASSISTANT ENGINEER (Shift Operation) on a two-shift rota at the Sub-Area Headquarters, Northampton.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class K, Grade 12 (£835 × £15 to £880 per annum, plus 10% shift allowance).

Candidates should have had experience of switching operations on a high voltage distribution system, preferably including both urban and rural networks. Experience in issuing and cancelling permits to work under the C.E. safety rules or acting as control engineer of part of a high voltage system would be an advantage.

Applications stating age and details of education, qualifications, experience, present position and salary, should be forwarded to The Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, to reach him within fourteen days of the issue of this advertisement. 2568

BRUSH ELECTRICAL ENGINEERING CO. LTD.

invites applications for the position of a

SENIOR RESEARCH AND DEVELOPMENT ENGINEER

in their expanding Switchgear Division.

The duties include the development of all new switchgear with associated investigations and also general research affecting switchgear and its applications.

Applicants should have had a good engineering education, preferably with a science degree, and with practical experience in industry.

A good salary will be paid commensurate with this appointment.

Applications, giving particulars of past experience and qualifications, should be addressed to the

Manager, Switchgear Division
Brush Electrical Engineering Company Ltd.
Loughborough, Leics.

2533

DRAUGHTSMEN AND DESIGNER DRAUGHTSMEN

are required by the

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED, LOUGHBOROUGH,

in their expanding Switchgear Division. Vacancies exist at their Loughborough works and also at their Manchester design office.

Applicants should have had previous experience in a drawing office, and preference will be given to those with a knowledge of switchgear. There is considerable scope for advancement.

A good salary will be paid and conditions of service include a non-contributory superannuation scheme.

Applications giving particulars of past experience and qualifications should be addressed to the Chief Personnel Officer, Brush Electrical Engineering Company Limited, Loughborough, Leics., and should quote reference SD.7352.

2548

WARWICKSHIRE COUNTY COUNCIL

Architect's Department

APPLICATIONS are invited for the following appointments :—

ASSISTANT ELECTRICAL ENGINEERS, £750-£1,030.

Applicants should possess Higher National Certificate or be Graduates of the Institution of Electrical Engineers and have had several years' experience in the design of lighting and small power installations.

The commencing salary can be within the grade according to ability and experience.

The appointments are on the established staff and subject to the Scheme of Conditions of Service of the National Joint Council for Local Authorities and the Local Government Superannuation Acts, 1937-53. The Council is unable to offer housing accommodation but consideration will be given to the granting of financial assistance towards removal expenses.

Applications are to be on forms which can be obtained from G. R. Barnsley, F.R.I.B.A., County Architect, Shire Hall, Warwick.

L. EDGAR STEPHENS,
Shire Hall, Clerk of the Council.
Warwick.
February, 1958. 2577

ENGLISH ELECTRIC

Control and Electronics Division

have vacancies on Service Contract work for:—

1. ELECTRONIC ENGINEER with experience in circuit development. Post involves high personal responsibility and offers excellent prospects. Applicants should be Corporate Members of I.E.E. or equivalent.

2. ELECTRONIC ENGINEER with experience in engineering development. Good opportunities exist for advancement after introductory period. Applicants should be H.N.C. standard or equivalent.

An attractive staff pension scheme is available and housing assistance can be offered to suitable candidates.

Applications giving full details of qualifications and experience should be made to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting Ref. ER.306E.

2580

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECTION ENGINEER required in the Liverpool South District. Salary within range £995/£1,055 per annum (N.J.B. Class H, Grade 7).

Applicants should have had experience in the construction, operation and maintenance of systems up to and including 33 kV and should possess suitable technical qualifications.

Appointment subject to medical examination. Pension scheme.

Special forms of application may be obtained from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool 3, and should be returned to him not later than 12th March, 1958. 2556

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Shin Group

APPLICATIONS are invited from suitably qualified engineers for the post of GENERAL ASSISTANT ENGINEER.

Salary N.J.B. E/10 (£685 × £15 to £730 p.a.). Superannuation scheme applicable.

Applications, stating age, qualifications and experience, should be forwarded to the Generation Engineer, Lairg Dam, Sutherland, by 15th March, 1958. 2535

AUSTRALIA—UNIVERSITY OF SYDNEY

APPLICATIONS are invited for the position of LECTURER IN ELECTRICAL ENGINEERING. The successful applicant will be required to assist with the teaching of electronics to students. Honours degree in engineering or physics and experience in vacuum tube and transistor circuits essential.

The salary for a lecturer is within the range £A1,200-£80-£A1,750 per annum, plus cost-of-living adjustment (£68 men, £51 women) and will be subject to deductions under the State Superannuation Act. (The current scale of salaries is under revision.) The commencing salary will be fixed according to the qualifications and experience of the successful applicant.

Under the Staff Members' Housing Scheme in cases approved by the University and its Bankers, married men may be assisted by loans to purchase a house.

Further particulars and information as to the method of application may be obtained from the Secretary, Association of Universities of the British Commonwealth, 36, Gordon Square, London, W.C.1.

The closing date for the receipt of applications, in Australia and London, is 5th April, 1958. 2590

HEAD WRIGHTSON

THE HEAD WRIGHTSON MACHINE COMPANY

require an

ELECTRICAL ENGINEERING ASSISTANT

age 25/30 years.

Applicants should have general knowledge of motor and control gear applications and be able to prepare preliminary schemes. Experience in estimating an advantage.

Write stating age, experience and salary range to :—

The Personnel Manager
Ref. M/ER/1
Teesdale Iron Works, Thornaby-on-Tees

2505

FIRST-CLASS OPPORTUNITIES FOR DESIGN ENGINEERS

A LIMITED number of vacancies will very shortly arise with BICC Ltd. at their Prescot works, for ENGINEERS qualified to degree standard with a sound knowledge of drawing office and workshop practice, to undertake specific projects involving original work on the design of low and medium voltage switch and fusegear. Each engineer will operate with a team of competent draughtsmen in a position of seniority offering considerable scope for initiative and enterprise.

The importance of the positions is reflected in the excellent salaries to be offered, which will be in the four-figure range. In addition, there are good prospects for advancement, and conditions of employment are excellent.

Applications, quoting reference P/21, should be addressed to :—

The Works Personnel Officer
BRITISH INSULATED CALLENDER'S CABLES LTD.
Prescot, Lancashire
(Tel. Prescot 6571)

2464

CITY ARCHITECT'S OFFICE, MANCHESTER

APPLICATIONS invited for the following appointment on the permanent staff : ASSISTANT ELECTRICAL ENGINEER. Salary, Special Grade, £750 to £1,030 per annum.

Forms of application from City Architect, Town Hall. Returnable by 14th March, 1958.

Housing accommodation for a limited period may be provided to successful candidate. 2558

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment :—

SHIFT CHARGE ENGINEER, GOLDINGTON GENERATING STATION.

Salary Class G, Grade 7, £935 × £20 to £995 per annum plus 10% shift allowance, shortly rising to Class H, £995 × £20 to £1,055 per annum.

Applicants should preferably have served an apprenticeship and obtain a recognised qualification in electrical or mechanical engineering and had experience in the operation of a generating station fired with pulverised fuel.

Apply by 8th March, 1958, quoting reference No. 2/8980, stating age, details of qualifications and experience, to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts.

W. N. C. CLINCH,
Controller. 2529

ELECTRICAL AND MECHANICAL SALES ENGINEERS

PROGRESSIVE company in West Africa with established London associates and excellent engineering agencies requires ELECTRICAL AND MECHANICAL SALES ENGINEERS of proven experience.

Accommodation, transport and medical attention free.

Basic salary dependent on experience but not less than £1,200 per annum. Commission payable.

These posts offer excellent opportunities for permanent and profitable employment dependent on personal efforts. Interviews in London.

Write Box "T.A." c/o J. W. Vickers & Co. Ltd., 7/8, Great Winchester Street, London, E.C.2.

2517

JOSEPH LUCAS (ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

DESIGNER/DRAUGHTSMAN

with experience in design of air break circuit breakers up to 2,000 amperes for medium-voltage A.C. applications and complying with B.S. and A.S.T.A. requirements. Position offers excellent opportunity for man with initiative capable of accepting responsibility and working with minimum supervision.

Salary commensurate with experience and technical qualifications.

Applications treated in strict confidence.

Box 2579.

WHOLESALE FITTINGS CO. LTD.

ELECTRICAL and Radio Distributors have the following vacancies:—

STOREKEEPERS
with experience of switchgear, cables and flexibles.

TRADE COUNTER ASSISTANTS
with experience of electrical accessories and knowledge of current prices.

CLERKS AND PRICING CLERKS
with experience in all types of electrical commodities.

Progressive vacancies in other departments for young men with experience of electrical wholesaling. Applications invited in confidence.

Vacancies also at Ilford and Hammersmith branches.

Apply in writing, stating age and experience to:—

Staff Manager
WHOLESALE FITTINGS CO. LTD.
46/52, Commercial Street, London, E.1

2589

EXECUTIVE APPOINTMENTS LIMITED

acting for a leading manufacturer of small mechanisms invite applications for two appointments as

(1) MECHANICAL ENGINEER

(2) ELECTRICAL ENGINEER

in the company's research and sales division on the southern outskirts of London.

Men, aged about 30, attracted by service in a progressive organisation which offers a starting salary in the range £800-£1,000 and good prospects are invited to apply if they have appropriate technical qualifications above H.N.C. standard and practical experience in the case of (1) of design or manufacture of small mechanisms, and in the case of (2) of electronics or light electrical engineering. Candidates must have enquiring minds and qualities of sound judgment and initiative.

Write briefly within 7 days, in the assurance that names will not be divulged to the employer without permission, to—

The Managing Director (RV.83)
EXECUTIVE APPOINTMENTS LIMITED
67, Wigmore Street, London, W.1

2544

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

FOURTH ASSISTANT ENGINEER required in the System Operation Department, Divisional Headquarters, near Bristol.

Superannuation scheme. Salary N.J.B. Class AX/EX, Grade 8, £710-£835/£935.

Applicants should have had a good general and technical education to Higher National Certificate standard with an aptitude for mathematics. Steam generating station experience is desirable.

Duties include general statistical work, particularly costing. Some day/evening duties in the control room may be required, for which the 10% shift allowance would be paid.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by 10th March, 1958. 2565

INTERNAL SALES ENGINEER

ELECTRICAL ENGINEER required to handle technical correspondence and orders in sales office of well-known instrument company. Knowledge of electrical instruments essential, and applicants must have a good standard of English. Pension scheme.

Please write fully to Personnel Officer, ELLIOTT BROS. (LONDON) LTD., Century Works, Conington Road, Lewisham, London, S.E.13.

2345

SOUTHERN ELECTRICITY BOARD

General Assistant Engineer

LYNDHURST DISTRICT of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class F, Grade 11 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

Applicants should have had experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems. The possession of suitable technical qualifications would be an advantage. The person appointed will be required to carry out standby duties if and when called upon to do so.

The successful candidate will be required to contribute to the Electricity Supply (Staff) superannuation scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him in envelopes suitably endorsed, not later than 10th March, 1958.

2570

TECHNICAL MANAGER FOR TRANSFORMER FACTORY IN SOUTH AFRICA

A TECHNICAL MANAGER is required by JOHNSON & PHILLIPS Ltd. for a small but expanding Transformer Factory in the Union of South Africa.

Applicants for this important appointment should have a good technical background, preferably with both design and production experience and a sound understanding of the transformer industry.

Detailed applications, which will be treated in the strictest confidence, should be sent to the General Manager, Overseas Department, Johnson & Phillips Ltd., Victoria Way, Charlton, London, S.E.7.

2504

FERRANTI LTD.

MANCHESTER

has a vacancy for a

DISTRIBUTION TRANSFORMER DESIGNER

Applicants should have experience in the design of transformers up to 1,500 kVA and preferably hold H.N.C.

This appointment will carry an attractive salary with the benefit of a staff pension scheme and dependants' insurance scheme.

Forms of application can be obtained from T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote reference DT.

2578

ELECTRIC MOTOR PRODUCTION

PRODUCTION MANAGER required for a unit manufacturing large and medium size motors.

Would be responsible with adequate staff for production control, material control, methods, work study, plant layout and labour.

First-class opportunity with considerable prospects for top-class executive. Applicants should preferably be age 32/40 and should apply stating full experience and qualifications to :—

Managing Director
NEWMAN INDUSTRIES LIMITED
Yate, Bristol

2545

Situations Vacant (continued)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Fourth Assistant Engineer (Telecommunications)

APPLICATIONS invited for the above post in the Electrical and Mechanical Engineer's Department at Pitlochry. Candidates should have experience in operation and maintenance of some of the following: remote control, metering and indicating equipment, carrier telephone and telegraph transmission equipment, V.H.F. radio and general signalling equipment. Good technical qualifications essential and possession of the final Group Certificate in Telecommunications of the City and Guilds of London Institute would be an advantage.

Salary commencing at a point within the range of £710 to £885 (N.J.B. Schedule B, Class AX/CX, Grade 8) depending on experience and qualifications. Superannuation scheme.

Application forms, obtainable from Secretary, 16, Rothesay Terrace, Edinburgh, 3, should be returned within 21 days from the publication of this notice. 2513

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED

invites applications for the position of

SENIOR DESIGNER

of Extra-High Voltage Switchgear. Applicants should have had a good engineering education and practical training with previous experience in the design and testing of switchgear. A good salary will be paid commensurate with the importance of this appointment.

Applications should give particulars of past experience, qualifications, etc., and should be addressed to the Manager, Switchgear Division, Brush Electrical Engineering Company Limited, Loughborough, Leics.

2546

BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED

has a vacancy for a

SENIOR CONTRACTS ENGINEER.

Applicants should preferably possess a university degree or equivalent, and have had experience in a switchgear manufacturing company.

The applicant will be required to co-ordinate the engineering and drawing office sides of large contracts and should preferably have some experience of associated commercial aspects.

Applications should give particulars of past experience, qualifications, etc., and should be addressed to the Manager, Switchgear Division, Brush Electrical Engineering Company Limited, Loughborough, Leics.

2547

SALES ENGINEER

YOUNG engineer required for outside technical sales staff in North Midlands Area for sale of Power Factor Correction Capacitors.

Applicants should be keen, energetic and able to drive a car.

The successful applicant will receive brief training and have access to established contacts and every assistance from existing staff.

Reply:—

Branch Manager
BRYCE ELECTRIC CONSTRUCTION CO. LTD.
175, Gibraltar Street, Sheffield, 3

2536

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

APPLICATIONS are invited for the position of FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER in the Hamilton District.

Applicants should be engineers with commercial experience, and preferably should hold an appropriate engineering qualification. The position is superannuable.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A; classification and grading E.6, salary £885/£930 per annum.

The successful applicant will require to reside within a reasonable distance of the Hamilton District office.

Forms of application, which may be obtained from the undersigned, should be forwarded to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.
137, Almada Street,
Hamilton. 2574

ASSISTANT FOREMAN (INSTRUMENTS)

THE Operations Branch of the UNITED KINGDOM ATOMIC ENERGY AUTHORITY, Industrial Group, requires an ASSISTANT FOREMAN at Windscale Works, Sellafield, Calderbridge, Cumberland, to install, maintain and test a wide range of electronic, industrial and laboratory instruments used in the detection and assessment of radio-activity.

A recognised apprenticeship, or comparable training in electronics, and experience in the maintenance of multi-unit electronic installations, are essential. Knowledge of laboratory counting methods and ability to advise on suitable instruments for these applications are required. Possession of appropriate O.N.C. or equivalent may be an advantage.

Salary £700 (at age 26) to £875.

Contributory pension scheme.

A house or assistance towards legal expenses on house purchase may be available.

Send POSTCARD for application form, quoting reference 2275, to Works Secretary, Windscale Works.

Closing date 3rd March, 1958. 2501

PRODUCTION MANAGER

required for Rubber and Thermoplastic Cable Division, with full responsibility for the operation, in accordance with budget forecasts, of departments making a complete range of these products.

This is a senior appointment covering all aspects of production administration, in addition to control of manufacturing personnel.

Applicants should preferably be qualified engineers and have some knowledge of rubber and/or thermoplastic cable manufacture, but consideration will be given to all suitable applicants with experience in the cable industry.

Applications, which will be treated in confidence, should state age, qualifications and experience, and be addressed to the Secretary, W. T. Glover & Co. Ltd., Trafford Park, Manchester, 17.

2537

AIR MINISTRY

WORKS Design Branch requires in London and Provinces ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution, H.V. and M.V. Technical training to O.N.C. standard or equivalent an advantage.

Salaries in LONDON up to £1,015 per annum. Somewhat lower in PROVINCES. Starting pay dependent on age, qualifications and experience. Long-term possibilities with pensionable and promotion prospects. 5-day week, 3 weeks 3 days leave a year.

Liability for overseas service. Normally natural-born British subjects.

Write stating age, qualifications, employment details, including type of work done, to any Employment Exchange, quoting Order No. Borough 104. 257

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Shakespeare Street, Nottingham

Principal:
D. A. R. Clark, M.Sc.(Tech.), M.I.Mech.E.

APPLICATIONS are invited for the following post:—

LECTURER IN ELECTRICAL ENGINEERING. Special interest and industrial experience in Electrical Power Engineering desirable.

The Electrical Engineering Department will occupy new premises from the beginning of next session. Good facilities are provided for research work.

Salary in accordance with the Burnham Technical Scale as follows: £1,200 rising by annual increments of £30 to £1,350 per annum.

Further particulars and form of application may be obtained from the Principal. Completed forms should be returned not later than 14th March, 1958. 2559

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT CONSUMERS' ENGINEER required in the Warrington District. Salary within range £590/£635 per annum (N.J.B. G/14).

The duties of the post will include estimating for contracting work, advising consumers on matters relating to electricity supply and the utilisation of electrical equipment.

Applicants should have received an engineering training. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, near Northwich, Cheshire. Closing date 12th March, 1958. 2572

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER (Operation) required at Oswestry. Salary within range £740/£785 per annum (N.J.B. E/9).

Applicants should have had experience in the construction and operation of E.H.T., H.T. and L.T. overhead and underground distribution systems, including indoor and outdoor substation equipment. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date 12th March, 1958. 2527

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

DEMONSTRATOR (Female). Candidates should have had a two-year full-time course in domestic subjects at a recognised training college and preferably possess the E.A.W. Certificate.

Previous experience of demonstrating will be an advantage.

Salary N.J.C. Grade 1, £500/£20/£600.

Applications giving full details of age, qualifications and experience, and the names of two referees, should be forwarded to the Manager, Yorkshire Electricity Board, No. 4 (Leeds) Sub-Area, Bramhope, Leeds, not later than the 14th March, 1958. 2569

ASTRAL SWITCHGEAR LIMITED

EXTENSION of sales organisation means the following appointments are shortly to be made:—

TECHNICAL SALES REPRESENTATIVE London Area. Experience of medium/light engineering in L.V. switchgear and allied fields is necessary; experience in negotiating with industrial users, consultants, etc., desirable.

TECHNICAL SALES REPRESENTATIVE Midlands Area. Experience generally as above.

Remuneration includes pension and life assurance scheme; car and expenses provided.

Please write giving full details to General Manager, Alma Road, Enfield. 2331

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
Vacancy No. 16/ER/58

APPLICATIONS are invited for the superannuable N.J.B. appointment of SECOND ASSISTANT ENGINEER, TECHNICAL DEPARTMENT at DIVISIONAL HEADQUARTERS.

Salary AX/DX4, £1,145-£1,375 per annum.

Applicants should possess the Higher National Certificate in Electrical Engineering, or an equivalent qualification, and have had considerable experience in the testing and commissioning of all electrical equipment in generating stations and on a 132-kV transmission system.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 7th March, 1958. 2532

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of COST ACCOUNTANT at No. 3 Sub-Area Headquarters at Chester. Salary within range £1,035/£1,125 per annum (N.J.C. Grade 7).

Applicants must possess a recognised accountancy qualification and be experienced in budgetry control and mechanised costing systems. Experience in the electricity supply industry would be an advantage.

Appointment subject to medical examination. Pension scheme.

Applications on forms obtainable from the Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester, must be forwarded not later than 12th March, 1958. 2571

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
Vacancy No. 15/ER/58

APPLICATIONS invited for superannuable N.J.B. appointment of SHIFT CHARGE ENGINEER at USKMOUTH POWER STATION.

Salary K.7, £1,160 to £1,235 per annum.

H.N.C. or equivalent qualifications desirable. Operating experience in a modern power station essential.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 12th March, 1958. 2531

CHIEF ELECTRICAL DESIGNER

for rotating machines, alternators and D.C. generators up to 100 kVA required by small firm in Birmingham area.

Applicants will be responsible only to directors and should possess a University Degree or Higher National Certificate.

State age, experience, present position and salary in strict confidence to—Box 2508.

AN electrical engineer (H.N.C.) is required by J. A. Crabtree & Co. Ltd. for development work in their electrical laboratory. Apply in writing to the Secretary, J. A. Crabtree & Co. Ltd., Lincoln Works, Walsall. 2538

APPLICATIONS are invited from suitably qualified engineers (25/35 years of age) capable of preparing complete electrical schemes for lighting, heating and power, including substation layouts and distribution for industrial undertakings. Only fully experienced engineers should apply. Salary £850/£950 p.a. Permanency. Apply — Christie Bros. Limited, Chelmsford. 2510

ASSISTANT electrical contract engineers required for head office appointment. Age 25-31 years and holding B.Sc. or other recognised electrical degree. Must have had at least two years' practical experience since qualifying, preferably on large power plant construction. Applications in writing to Personnel Officer, Ewbank & Partners Ltd., Engineering Consultants, 10/11, Grosvenor Place, Hyde Park Corner, London, S.W.1. 2512

ASSISTANT works manager required for electric cable works, paper-insulated section. Reply with full details of past experience to the Managing Director, Sterling Cable Company Ltd., Aldermaston, Berkshire. 2251

ARMATURE winder. Progressive firm requires for repair shop winder having sound knowledge all types A.C. and D.C. work. This company has other activities and there are good prospects of advancement for skilled man with initiative and some administrative ability. Write to—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 2403

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., 24, Fennel Street, Manchester, 4. Electrical surveyors required for various districts in Great Britain. Permanent positions carrying progressive salary scale £735 to £1,060 and non-contributory pension. Candidates, age 26 to 32, preferably with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply in own handwriting, stating age, qualifications and experience. 2557

BRUCE PEEBLES & Co. Ltd. have a vacancy for a technical sales engineer in their rotating plant sales (quotations) department. 5-day week, staff pension and production bonus schemes. Assistance with removal expenses and house purchase where necessary. Applications stating age, qualifications and experience to Manager Rotating Plant Department Edinburgh, 5, quoting reference FH/Sales. 2437

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 273

CONSULTING engineers require junior electrical engineers and draughtsmen. Apply giving details of qualifications, experience and salary required to—Box 160.

CONSULTING engineers require urgently junior electrical draughtsmen conversant with lighting and power designs for industrial building schemes. Good conditions, site visits, non-contributory pension scheme, bonus scheme, luncheon vouchers, etc. Write or phone—Messrs. A. F. Myers & Partners, 147, Victoria Street, London, S.W.1 (TAT. 8241). 2438

COPYWRITER required by West Midlands electrical manufacturing company for the preparation of press advertisements, technical publications and articles. Applications, giving age, experience and salary required should be addressed to—Box 2551.

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary. Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middlesex. 274

DRAUGHTSMAN required immediately for light electro-mechanical instrumentation of precision nature. Previous experience of this work essential and O.N.C. in Electrical Engineering advantageous. Pleasant conditions, 5-day week, A.E.S.D. rates, bonus and superannuation schemes. Apply—Hendrey Relays Limited, 392, Bath Road, Cippenham, Slough, Bucks. 2519

DRAUGHTSMAN required. This is a unique opportunity for a keen young man with experience in the design and detail of electro-mechanical devices. Applicants must be willing to undertake all duties connected with a drawing office, and should be of at least O.N.C. standard. Five-day week, canteen facilities, paid holiday this year. Salary £600/£700 per annum, depending upon experience. Company situated in Hoddesdon district. Write giving full details to—Turnright Controls Ltd., West Hill, Hoddesdon, Herts. 2520

DRAUGHTSMEN, both senior and junior, required. Applicants should have either contract development or diagram experience on switchgear up to 11 kV, although men with good electrical or mechanical knowledge will be considered. Excellent working conditions. Good prospects. 5-day week. Superannuation fund. Interviews arranged Saturdays if desired. Apply giving full details of training and experience to — Personnel Officer, Crompton Parkinson (Chelmsford) Limited, Chelmsford, Essex. 215

DRAUGHTSMAN, electrical, with experience in switchboard and fusegear design. Top rate with superannuation and bonus. Apply giving full experience and particulars to—Artic Fuse & Electrical Manufacturing Company, Ltd., Birtley, Co. Durham. 2518

ELECTRIC element manufacturers require experienced technician for development and production for industrial application. Progressive post for keen young man. S.W. London. Please write stating age, experience and salary expected.—Box 2439.

ELECTRICAL and radio wholesaler requires experienced representative for North Somerset, West Wilts area. Fullest particulars including previous turnover, salary, etc., to—Box 9287.

ELECTRICAL contractors, old-established firm, Gloucester area, require experienced supervisor/estimator to manage contracting dept. Write age, experience, salary expected—Box 9283

ELECTRICAL design engineer required. Experience in heavy industrial motors and switchgear essential. Must be able to initiate and develop full electrical control schemes allied to chemical plant. A knowledge of instrument electrical control systems an advantage.—Air Products (Great Britain) Ltd., 9, Upper Belgrave Street, London, S.W.1. 2511

ELECTRICAL engineer required by W. J. Furse & Co. (Manchester) Ltd., 20, Mount St., Manchester, 2, as manager for South Wales branch. Good prospects for right man. Must be capable of increasing turnover consisting of heavy electrical and other contracts, controlling office and outside labour. Apply to Mr. J. K. Furse, stating qualifications, experience and age. 2521

ELECTRICAL engineer required in London area for the design of electrical installations in all types of buildings. Must be capable of running a project through all its phases including site supervision. Write giving full details of qualifications, experience and salary required to Box ER 784 LPE, Romano House, 399/401, Strand, London, W.C.2. 2490

ELECTRICAL engineer required, aged 25 to 40, capable of designing and supervising electrical engineering installations for all types of buildings. Apply, with details of experience and salary required, to — J. Stinton Jones and Partners, Consulting Engineers, 21, Gloucester Place, London, W.1. 2348

ELECTRICAL engineers required for development work on capacitors. Those interested in problems of insulation and dielectrics which offer great scope for experimental research should write to—Stability Capacitors Ltd., Raven Road, London, E.18. 2334

ELECTRICAL installation contractors require assistant contracts manager. Age 30/40. Must have had practical experience of all classes of small contracting installations and able to take charge from enquiry to final accounts. Early promotion to managerial position for man with drive and initiative. The company is an old-established one and has been in the Electrical Contractors' Association for 35 years. Good salary and bonus.—Box 2549.

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works. Inverness Road. Hounslow, Middx. 275

EVERSHED & VIGNOLES Ltd. require two engineers of H.N.C. standard for their instrument division sales department. White giving full details of training and experience to—Instruments Manager, Acton Lane Works, London, W.4. 2581

E.M.F. wholesaler shortly opening new branch in the London area offers four-figure salary to man able to assume and carry out the responsibilities of service manager. Only those with first-class experience in the trade need apply. —Box 9279.

EXPERIENCED lady demonstrator required by a leading electrical cooker manufacturer for the North of England. Must be willing to travel. Please apply giving full particulars of qualifications and experience in confidence to—Box 2582.

CLASSIFIED ADVERTISEMENTS ARE PREPAID

***Situations Vacant** (continued)*

FOSTER Transformers Ltd., South Wimbledon, London, S.W.19, have vacancies for testers for work on all types of transformers up to 3,000 kVA. Applicants should have had some training or experience in the electrical industry. Apply in first instance giving details of experience and salary required to the Personnel Officer. 2522

IMPERIAL CHEMICAL INDUSTRIES Limited, Plastics Division, has a vacancy for an electrical engineer. Appointment will be to either the Headquarters staff at Welwyn Garden City or at the Division's Hillhouse factory located near Blackpool (Lancs). Applications are invited from men in the age range 28/35, holding a degree in electrical engineering or, alternatively, Associate Membership of the I.E.E. It is essential that candidates should have had some years' experience of industrial plant, preferably in the chemical field. An attractive starting salary will be offered to the selected applicant, beyond which there is plenty of scope for progressive remuneration. The appointment carries membership of the staff pension fund and a profit-sharing scheme is in operation. For married men special mortgage facilities can be granted towards house purchase, and assistance is given towards removal expenses. Temporary lodging allowance also available for married men. Apply briefly to the Staff Manager, Imperial Chemical Industries Limited, Plastics Division, Black Fan Rd., Welwyn Garden City, Hertfordshire. 2435

J. A. CRABTREE & Co. Ltd., Walsall, require for their South African factory an electrical engineer with experience in the manufacture of control gear. This is an excellent opportunity with wide scope for a man with initiative who will work directly under the Works Manager. Please reply giving personal details and details of experience to the Technical Director, J. A. Crabtree & Co. Ltd., Lincoln Works, Walsall. 2552

JUNIOR electrical engineer required in London area to assist in designing of electrical installations in all types of buildings. Scope for advancement for suitable man. Write giving full details of qualifications, experience and salary required, to Box ER 785, LPE, Romano House, 399/401, Strand, London, W.C.2. 2491

JUNIOR engineer required capable of assisting in the preparation of complete electrical schemes and estimates for lighting, heating and power in industrial buildings. Apply with full particulars to—Christy Bros. Limited, Chelmsford. 2509

JUNIOR technical assistant required for investigational work in cable factory. H.N.C. preferred but O.N.C. with some experience would be considered. Apply giving age, qualifications and experience to—Box 2367.

JUNIOR technical engineers and draughtsmen required for work on design of electrical engineering installations for hospitals, colleges, factories, etc. (5-day week). Salary dependent upon age and experience. Apply, with details, to—J. Stinton Jones and Partners, Consulting Engineers, 21, Gloucester Place, London, W.1. 2349

LARGE London electrical wholesaler with expanding turnover requires representative. Only a really energetic man considered. Write in first instance giving full details, age, experience, etc., to—Box 2550.

LONDON plastic cable manufacturers require travellers. Write full details, age, experience, territory covered.—Box 2423.

MANUFACTURERS of automatic electrical control equipment expanding production require commission basis representatives in the Midlands and North of England.—Box 2583.

OPPORTUNITY offered to young man with electrical background to join the sales staff of an established firm of electric motor manufacturers in London.—Box 2351.

PERMANENT jobs for good craftsmen. T.U. chargehands and electricians experienced in carrying out best class conduit installation work required for London area. State age and details of previous employment.—Box 2539.

SWITCHGEAR sales engineer (inside) required to deal with enquiries and orders for a wide range of substation and power station switchgear. Applicants should have a fair knowledge of switchgear requirements and should state their technical qualifications and practical experience. Apply in first instance to the Personnel Officer, Ferguson Pailin Ltd., Higher Openshaw, Manchester, 11. 2455

REPRESENTATIVE required with real live connections amongst factories, stores, contractors, etc., in London and Home Counties by old-established E.W.F. electrical wholesaler. Excellent prospects, good salary, expenses and commission. Write in confidence stating age and experience to—A. S. Duran & Co. Ltd., 30, Kings Road, Reading. 2506

SALES engineer (outside) required for London office of leading electrical distribution gear manufacturers. Contacts with Government departments advantageous. Age approx. 35. Salary and expenses. Pension scheme. Write stating age, technical qualifications, experience and salary required.—Box 2540.

SALES order clerk required, senior post. Well paid position offering scope in the future. Superannuation scheme. Canteen and social club facilities. Experience of electrical wholesaling essential. Apply—Managing Director, Halsey's Electric Co. Ltd., Brandon House, Wyfold Rd., London, S.W.6 (Tel. Fulham 3355). 2409

SURVEYOR required for wood pole line contract in Inverness area. Good salary and subsistence to right man. Apply in writing to — B. French Limited, Pike Mills, Kidderminster. 2352

TECHNICAL engineer required in development department of cable works. University degree essential and should have completed National Service. Some experience of cable and dielectric problems an advantage. Apply giving full details to—Box 2368.

TESTER of automatic electric control equipment required. Interesting work with good prospects. O.N.C. standard preferred. Five-day week, pension scheme, canteen facilities. Please write giving full details of age, previous experience, qualifications, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Road. Hounslow, Middlesex. 277

THE TELEGRAPH CONSTRUCTION & MAINTENANCE Company Limited, cable manufacturers in the S.E. London area, require a technical assistant in their cable design and specification section for the preparation of designs and to provide technical information concerning cable accessories. A salary of £750 upwards is offered to suitable applicants. Apply to—Personnel Manager, Telcon Works, Greenwich, London, S.E.10. 2445

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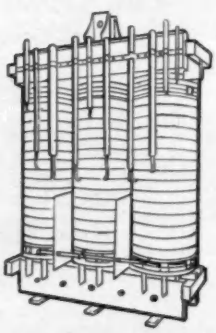

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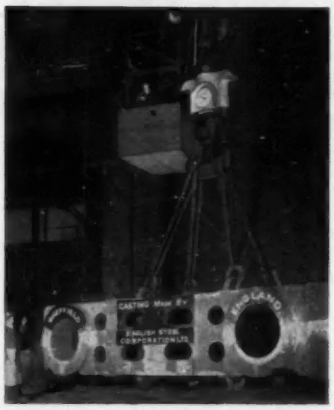

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LONDEX Pressure Switches

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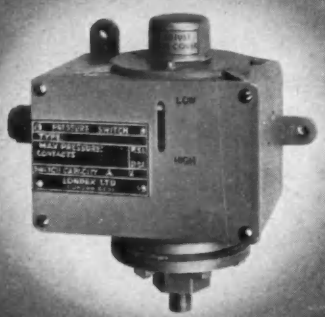

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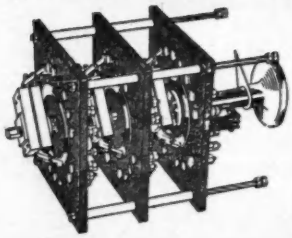

Interlocked with micro break switch

Pull Handle to release Lock, then turn

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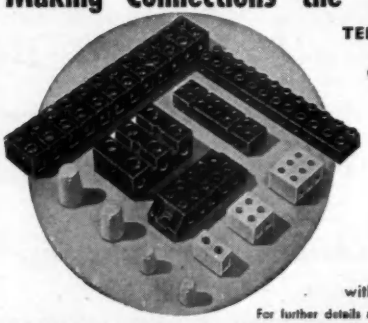

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- MOULDED 5 - 40 Amp. 1 - 12 Way
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Fluorescent lighting has entered the home in a big way, via the kitchen; and for you that's an opportunity to grasp, money to be made with little effort. The Atlas Kitchenlight—a pre-packed easily installed fluorescent fitting, offers women a completely new standard of lighting in the kitchen. Tens of thousands are already in use and substantial advertising in leading women's magazines will still further increase the demand. Put in stocks and give yourself a new and profitable line, now.

it's new business,

big business,

profitable business—

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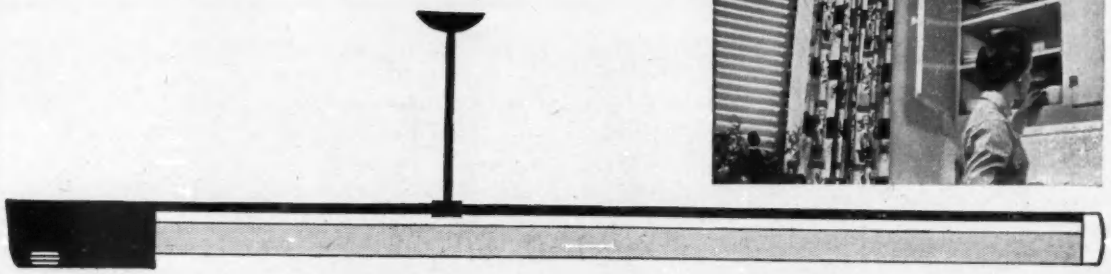

ATLAS kitchenlight

pre-packed fitting, patented starter-ballast lamp and 4 ft. Atlas White Tube.
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From your usual wholesaler or
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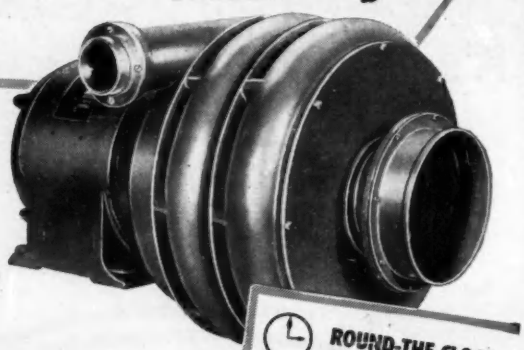
it's High Velocity

suction and blowing



Greater pressure or suction without increased impeller diameter?

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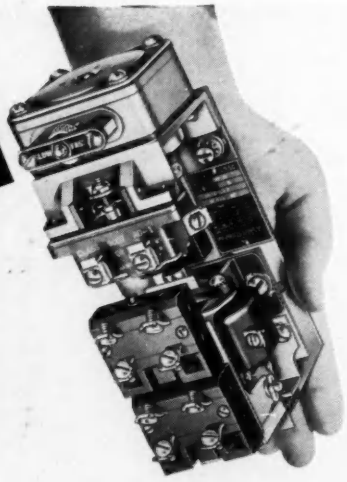
Square D
Design Leadership
in action

3 New timers



New . . . Type B

Now with narrow base for space saving

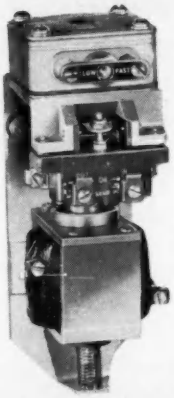
Class 9050 Pneumatic Timers, the machine tool standard for more than 20 years—are now improved to save 35% of mounting space. As before, the A.C. timers have a range from 0.2 seconds to 3 minutes and accommodate up to 2 n.o. and 2 n.c. auxiliary switches. Available for panel mounting or a variety of enclosures.

New . . . Type B

Flush Mounting Timer

Ideally suited for mounting in enclosures or doors where external adjustment is desirable. This A.C. Pneumatic Timer has a heavy sheet steel flush plate and the same range, and high degree of repeat accuracy as all Square D Timers. Type B Timers are convertible from time delay after energisation to after de-energisation. Designate as Class 9050.

Whatever your timing problem— one of these timers will do the job— *Precisely!*



New . . . Type C

D.C. operated

Using the identical timing head as the Type B, these Type C Timers have a D.C. operated magnet for voltages up to 250 Volts D.C. Types B & C Timers are available with micrometer dial or knurled knob adjustment. Also, designate as Class 9050.

Write for Timer Bulletin 9050

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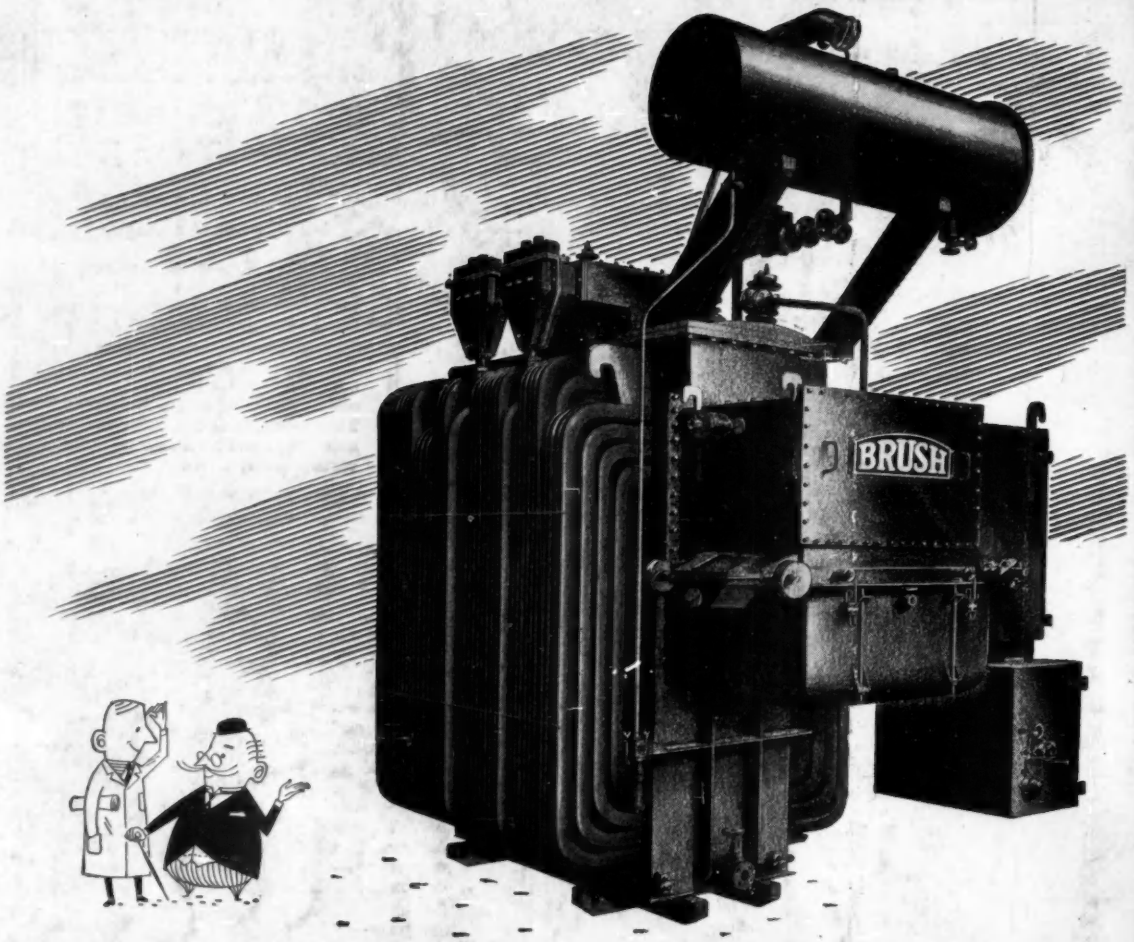

Why must we have a Brush transformer?

Oh, well, sir, you see . . . Well, there's so much one can say . . .

Well then say it, man! Why Brush?

Look sir, it's like this. Brush built their first transformer in 1880. Since then they have gained a towering reputation for their consummate skill and thoroughness, for the utter dependability and the mechanical and electrical strength of their transformers. You find Brush transformer installations all over the globe—from Walsall to Wagga Wagga: from Curaçao to Christchurch—and many of them have been in service for fifty years or more.

You mean it's Brush experience that counts?

And their tradition. The fact that they have the craftsmen—to make super-tension units, for instance—and they have built up the facilities for transformer production over many years. And that these things are backed up by constant laboratory research. You see, their knowledge of how to design and construct transformers for all possible conditions is tremendous. Look at their high-speed resistor-type tap changing gear . . .

Don't say another word! Just get in touch with Brush.

BRUSH
the power people

For further information on Brush transformers and tap changing gear, write to:
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